name, Mrs. Hersh?

MRS. HERSH: This is Dr. Thomas H. Jukes, your Honor, and he is sitting here next to me.

ADMINISTRATIVE LAW JUDGE KENDALL: Very well. And he is present at this time.

MRS. HERSH: Yes, he is.

ADMINISTRATIVE LAW JUDGE KENDALL: Fine. You have no objection to waiving the rule as to that particular witness--

MR. BURGESS: No; no.

ADMINISTRATIVE LAW JUDGE KENDALL: -- for the limited purpose stated?

MR. BURGESS: None at all.

Dr. Linus Pauling.

ADMINISTRATIVE LAW JUDGE KENDALL: Dr. Pauling, come forward and be sworn, will you please?

LINUS PAULING, Ph.D., called as a witness by the State, was sworn and testified as follows:

ADMINISTRATIVE LAW JUDGE KENDALL: Do you swear the testimony you are about to give in this matter will be the truth?

THE WITNESS: I do.

ADMINISTRATIVE LAW JUDGE KENDALL: Please be seated. And would you state your full name for the record please?

THE WITNESS: I'm Linus Carl Pauling.

ADMINISTRATIVE LAW JUDGE KENDALL: Thank you. Dr. Pauling, give an address. It can be personal or professional as you choose.
THE WITNESS: Yes. My legal address is Deer Flat Ranch, Big Sur, California.

ADMINISTRATIVE LAW JUDGE KENDALL: Thank you.

DIRECT EXAMINATION BY MR. BURGESS

Q. Dr. Pauling, could you tell us, if you would please, where you received your undergraduate training?

A. I received the degree of Bachelor of Science in Chemical Engineering from Oregon Agricultural College in 1922 and a Ph.D. degree in chemistry, physics, mathematics from California Institute of Technology in 1925.

Q. And subsequent to that, Doctor, what was the nature of your work in the field of science?

A. I began work in physical chemistry in 1922. It was on the determination of the structure of crystals by the X-ray diffraction method, and I soon began theoretical work applying quantum theory and, after 1925 or '26, quantum mechanics to physical and chemical problems. Later, starting in 1930, I made use of electron diffraction of gas molecules to determine the structures of gas molecules. In 1935, I began work in the field of biochemistry by studying hemoglobin, the oxygen equilibrium curve and the magnetic properties of hemoglobin; and in 1940, I began -- much of this work done in collaboration with my students and the postdoctoral fellows -- work in the field of immunology for about ten years. Then in 1945, I began the study of the hereditary hemolytic anemias. In 1954, I began the study of schizophrenia and mental retardation as possible molecular diseases. By 1969 -- well, around 1970, I had become
interested in nutrition, especially in vitamins.

Q. And could you tell us, Doctor, what institutions you have been associated with as a member of the faculty over your career in chemistry?

A. I was on the faculty of the California Institute of Technology for 42 years, from 1922 to 1964. Then for three years, I was with the Center for the Study of Democratic Institutions in Santa Barbara; for two years as professor of chemistry at the University of California, San Diego; for five years as professor of chemistry in Stanford University. That's up till 1974. Now, I was for a year Eastman professor in Oxford University, for half a year George Fisher Baker professor of chemistry in Cornell, for a month or two each year for five years visiting lecturer in Berkeley, University of California. For a month, I was Raman professor in the University of Madras, and I've had shorter periods as a lecturer or visiting professor in many other universities.

Q. During your career, Doctor, you have written, I know, extensively in the field of chemistry and other related fields of science. Without going into the exhaustive list, could you indicate to us some of the works that you feel are most significant to the topics we will be discussing here today?

A. Almost all of my work has been based on molecular structure, the structure of molecules and its relation to the properties of these molecules. The work on immunochemistry that I carried out from 1940 to 1950 I think had significant bearing on my later interest in medicine. It had -- work that I carried out on hemoglobin from 1935 on led me to propose in
1945 that there are diseases that could be called molecular
diseases.

And in 1949, my associates, three students of mine,
especially Dr. Harvey Itano, who is professor of pathology at
UC San Diego now, led to the verification of this idea in that
we showed that sickle cell anemia is a disease of the
hemoglobin molecule. In our 1949 paper, we used the title
sickle cell hemoglobin -- "Sickle Cell Anemia, a Molecular
Disease." We discovered several other abnormal human
hemoglobins in the following years, and now there are some
abnormal human hemoglobins known; and the field, of course, is
called the hemoglobinopathies, a name that couldn't have been
applied before it was discovered that there are diseases of
the hemoglobin molecule.

Then I decided when Dr. Itano left me to go back to
Bethesda, that I should look at other diseases to see to what
extent they might be molecular diseases. I decided to work on
mental diseases; and with my associates in the California
Institute of Technology and with the support of grants from
the Ford Foundation and the National Institute of Mental
Health, we carried out studies in that field. At the end of
that period of time, I learned about the use of what are
considered very large doses of vitamins to help to control
schizophrenia. That was about 1930 -- 1965 or '6, after the
ten years that I had been working on mental illness. I began
to check up on the reports of the value of amounts, doses of
some of the vitamins, a thousand times the RDA in order to see
what evidence could be obtained about their relation to human
physiology, the properties of human beings ingesting these extraordinarily large intakes of vitamins.

In 1970, I wrote my book Vitamin C and the Common Cold; and in 1971 I had become interested enough in reports about vitamin C in relation to cancer to encourage my present associate, Dr. Ewan Cameron, who was then chief surgeon in Vale of Leven Hospital, Lock Lomondside, Scotland, to try large intakes of vitamin C on his cancer patients -- terminal cancer patients as an adjunct to appropriate conventional therapy.

So for the last 13 years now, I have been especially interested in vitamin C and cancer and in other nutrients in relation to cancer, more recently, also, in relation to other diseases, such as kidney disease, which is a cause of suffering for a very large number of people.

Q. Doctor, you have omitted each time I've asked you to outline your career the fact that you have received the Nobel Prize and been awarded the Nobel Laureate on two occasions; is that correct?

A. That's right.

Q. And no other person except Marie Curie has that distinction; is that correct?

A. Well, that's not quite true. Marie Curie received a quarter of a Nobel Prize and then a full Nobel Prize. In recent years, two American -- no, two scientists -- three -- two scientists have received a part of a Nobel Prize or part of two Nobel Prizes. I'm the only person to have received two unshared Nobel Prizes, but --
Q. Doctor, could you tell us: The first Nobel Prize that you were awarded, for what work was that?

A. The citation said: "For his contributions to the understanding of the nature of the chemical bond and its application to the elucidation of the structure of complex substances."

I have interpreted that to cover all of my early work on molecular structure and the structure of metals, inorganic compounds, organic compounds, the theories of resonance in chemistry and application, for example, to protein structure, where I have formulated the alpha helix structure and the two pleated sheet structures, the principal secondary structures of protein molecules.

Q. Now, Doctor, could you tell us -- during the discussion, you mentioned the theory of molecular disease. Could you now focus on that and tell us, so that we can all understand fully that concept, what your findings were and what your conclusions were in regard to molecular disease?

A. The medical scholars had, in previous decades and centuries, talked about diseases of organs and, I think Virkoff (phonetic), about diseases of cells. The idea that I had in 1945 is that there could be diseases of molecules.

With a simple molecule, such as glucose or ascorbic acid, there's nothing you can do to change the nature of the molecule without having it become a molecule of some other substance. The hemoglobin molecule contains about 10,000 atoms. The number of atoms is so great -- and this is in the form of about 600 amino acid residues in four polypeptide chains.
chains. The number of atoms is so great that one can think of changing some of the atoms, replacing one amino acid residue by another, say, and still feel that one has a molecule of hemoglobin. And of course, we knew that animals of different species produce molecules of hemoglobin that are characteristic of that species, different from one another. No one had ever suggested that one human being, adult human being, manufactured hemoglobin molecules that were different from those manufactured by other hemoglobin -- other human beings so far as I'm aware until I had this idea in 1945.

The idea was that a small genetic mutation might occur in a human being such that one amino acid residue in a chain in the hemoglobin molecule was replaced by another, that this might make the molecule, which is rather large on the molecular scale, have a region on one surface complementary to that on the opposite side in the same way that antigens and antibodies are mutually complementary on the atomic scale. And that then these hemoglobin molecules would clamp onto one another to form long rods that would line up side-by-side to make long crystals that would grow finally long enough to twist the red cell out of shape and to change the properties of the red cell membrane, make it sticky and in this way produce the manifestations of the disease, sickle cell anemia.

It took my associates and I four years to carry out experimental studies that proved that this is in fact true. And since that time, of course, there are hundreds of diseases that have been identified as molecular diseases.

Q. You have indicated -- we have in earlier testimony,
though you haven't used the phrase, discussed or heard discussed the term or the phrase "orthomolecular medicine." Other witnesses have attributed to you the fatherhood of that concept, of orthomolecular medicine.

Let me ask you at the outset: Are you familiar with the term "orthomolecular medicine," Doctor?
A. Yes, I invented it.
Q. All right. Could you tell us then, when you coined that phrase and utilized the concept, what it was that you meant by that?
A. Well, it was 17 or 18 years ago, as I was thinking about the work that Hoffer and Osmond had done in Canada and that Milner had done with vitamin C in schizophrenic patients, I realized something that I had never thought of before and never seen discussed in the literature so far as I could remember. It is this: A drug is usually more effective in controlling a disease the more that it is used by the patient, given to the patient. The limit on increasing the effectiveness by increasing the dosage comes from the toxicity of the substance. Most drugs are effective therapeutically only in dosages that come rather close to severely toxic or even a lethal level.
Q. Let me interrupt for a moment, Doctor: Are there studies that support that conclusion that you've just stated, that the effectiveness of a drug tends to increase the closer you get to the level of toxicity in the utilization of the drug?
A. Oh, there are extensive studies showing that the effectiveness of a drug increases with the increase in the
dosage, and there's a practical limit. The lethal dose expresses the practical limit.

Q. Go ahead, Doctor.

A. Now, what I realized after some time after I had been reading the papers by Hoffer and Osmond and Milner is that the vitamins are, extraordinarily, exceptions to this general principle. I knew that a little pinch, five milligrams of -- of niacin, nicotinic acid or nicotinamide every day is enough to keep a person -- most people from dying of pellagra, so it's a very powerful physiological agent. I knew that a patient can take 10,000 times that much, 50,000 milligrams a day, without any serious side effects. If he takes niacin, there's a flushing reaction that he gets used to after a few days. With niacinamide, this reaction doesn't occur.

Similarly, with ascorbate, ascorbic acid, vitamin C, five milligrams a day, just this little pinch is enough to keep almost every person from dying of scurvy, but I have taken 50,000 milligrams a day for several days in succession without having any serious side effect, and I know people who have taken a hundred and fifty thousand milligrams, a third of a pound a day, day after day for years without any serious side effects.

I thought these are really extraordinary substances. These are substances that are normally present in the human body. Human beings and their predecessors have become accustomed to them over millions of years. They are extraordinary in that they have extremely low toxicity and despite that have a very powerful physiological effect.
I thought there are really two questions we can ask about a vitamin. One: What is the amount that keeps you from dying of the corresponding deficiency disease, beriberi or scurvy or pellagra or other deficiency disease? The other question is: What is the amount that puts a person in the best of health? And one has 10,000 -- for many of these substances, a thousand or 10,000 fold range of intakes as a possibility to be investigated to find out the amount that puts people in the best of health.

So as I kept thinking about this matter, I thought, here at my age, about 65 then, 20 -- 19 years ago -- or 64, 18 years ago, I thought -- or '63 -- let's see. I'm getting confused. I'm 83 now. Just had my birthday, so --

Q. Tuesday, I understand.

A. That's roughly in my sixties. I thought, here I've reached this stage in my development where I have been very interested in reading and learning more about the world, and I don't remember anybody's having pointed out that there is this extraordinary difference between these substances and ordinary drugs, and I think this needs to have a name. I'll call these substances orthomolecular substances, meaning that they are the right substances and that they should be taken -- the right molecules and they should be taken -- put into the human body in the right amounts, and I'll say that this is orthomolecular medicine, this field of medicine.

Q. Now, can you tell us, if you will please, Doctor, after you designated this field, gave it a nomenclature, in effect, do you know either from your own work, the work of your
associates or the work of others with which you were familiar whether studies have been done to further the underpinnings and theories that you first formulated in this field?

A. Well, the -- I have the benefit of knowing a great number of facts about nutrition and about disease, medicine in general, papers that have been published in medical literature, and in knowing a good bit about chemistry, too, the chemical basis, molecular basis of physiological activity of substances. I knew that the literature of vitamin C was an extensive one, a thousand papers published a year; very difficult for me to follow it. Since the publication of my book, Vitamin C and the Common Cold, there's been about a ten-fold increase on the number of papers published by investigators on vitamin C and it's very hard to follow this literature, but I've tried to follow it. In our laboratory, the laboratory where I work, we have carried out some studies ourselves, but of course, our own contributions constitute only a small part of the immense body of information that has been gathered by scientists and to some extent also by physicians.

Q. Are you familiar, Doctor, with whether or not there are studies either done by yourself or by you and your associates or by others of which you are aware that relate to the efficacy of large doses of vitamin C with cancer patients?

A. Yes, I am familiar with this field. My associate, Dr. Ewan Cameron, and I published a book in 1979, I think, with the title Vitamin C and Cancer. The first half -- or Cancer and Vitamin C. The first half is a discussion for the layman
and to some extent for the physician of cancer, and the second half is about vitamin C and the use of vitamin C as an adjunct to appropriate conventional therapy in the control of cancer, both prophylactically and therapeutically.

Q. Now, you indicated in both that answer and in an earlier answer, that in the context of cancer, vitamin C was an adjunct to appropriate and conventional therapy; is that your position, Doctor?

A. That's my position still, yes.

Q. What role -- if you can articulate it to us, what role does vitamin C play in that scheme of dealing with cancer?

A. The -- well, I reached the conclusion a good number of years ago now, when I was asking myself the question about the optimum intake of vitamin C, that the optimum intake for human beings might well be in the range 10 grams to 20 grams per day; that is, with an intake of this magnitude, the human body functions best, is in the best of health. The result of my having reached that conclusion is that I also concluded that, to have the best chance of preventing or controlling essentially any disease, it would be wise to have the intake of this important substance, such that to put the human body in the best of health, in the best position to resist disease.

So this conclusion does not apply only to cancer. It applies to essentially every disease; that a person has the best chance of surviving, of being in good health, of having a long life if he is properly nourished, and the evidence -- and I deal mainly with facts here. The facts support the idea, the conclusion that around 10 grams a day of vitamin C,
possibly somewhat more, is the optimum intake for human beings. We can expect, of course, some difference from one human being to another because of biochemical individuality.

Q. But that is, as you said, the optimum figure in this context; is that correct, Doctor?

A. That's right. There is a sort of natural limit to the amount of vitamin C that one can take by mouth.

Q. How is that manifest in the human organism?

A. It manifests itself apparently through an interaction with prostiglandin (phonetic), PGE 1 in the gut, brings water into the gut and has a laxative effect by producing this laxative effect at a certain intake. For most people in ordinary poor health, the intake is around 10 to 15 or 20 grams a day. That produces enough of a laxative effect so that a larger intake would become a nuisance.

Sick people -- my associate Dr. Cameron working in Scotland found that people seriously ill with cancer could take much larger amounts by mouth without showing this laxative effect, possibly because they are not synthesizing the prostiglandin PGE 1 at a large enough rate, at the normal rate. As these cancer patients got better, their bowel tolerance level decreased.

Q. Well, Dr. Robert Cathcart has also testified here and indicated that his findings were the same; that as illness became more acute, the capability of ingesting vitamin C went up, and as the illness tended to subside, the level at which, as he called it, diarrhea set in became lower. Is that consistent with your findings?
A. Yes. That these were made -- these observations were made in -- the initial ones were made in Scotland in Vale of Leven Hospital by my associate Dr. Ewan Cameron. I was not in residence there. I had encouraged Dr. Cameron in 1971 to begin giving these relatively large amounts of vitamin C to cancer patients, and I visited him often there.

Q. In your study of his work or in your -- in the published reports of his work, what if any negative effects other than the laxative effect was noted in the patient population he treated with vitamin C?

A. Dr. Cameron reported on one patient of the first forty who -- terminal, untreatable cancer patients to whom these large doses of vitamin C were given, that the response of the patient to the initial large doses of vitamin C was catastrophic. The patient had cancer of the throat and apparently, presumably because of the vigorous attack on the tumor by the stimulated immune system -- potentiated immune system of the patient, the tumor sluffed off, producing -- causing a hemorrhage that could not be controlled, and the patient died.

There is the possibility, Dr. Cameron feels and I feel, that a patient with a very large malignant tumor might respond through the attack on the tumor and subsequent necrosis, sluffing off, production of toxic substances, that might kill a patient in this sort of catastrophic way. Not many patients, very few, have been observed to respond in that way, but that's one possibility.

Q. Would that risk exist in the initial stages of...
endometrial cancer in a female patient, Doctor?
A. I would say not. I think this is a risk that has to be kept in mind for any patient with a very large tumor.
Q. It is, as I understand your testimony and the studies, the efficacy of vitamin C in attacking the tumor that seems to produce catastrophic side effects; is that really what is happening or what appears to be happening?
A. The -- the facts are these: We know that -- we know from experimental observations that vitamin C potentiates the immune system in several different ways. It stimulates large doses of vitamin C, stimulates production of increased amounts of antibodies, IgG and IgM, not IgE, but of these other two antibodies, which would seek out malignant cells and mark them for destruction. Increased amounts of complement -- molecules of complement are produced. This has been shown for the C-1 esterase component of complement. And the complement molecules attach themselves to this complex to help prepare it for destruction.

Vitamin C is required in phagocytic cells, for phagocytic activity. It must have a level of two -- of around 20 micrograms per hundred million cells. If it falls below that level, the phagocytic activity does not exist. The mechanism of this presumably is that the -- there's evidence for this that the ascorbate reacts with dioxygen to cause a free radical which has the power of splitting polypeptides, proteins, breaking down proteins, also splitting polynucleotides, breaking down nucleic acids, and in other ways, this ascorbate/dioxygen free radical mechanism might be
involved in phagocytosis.

The effectiveness in the destruction of malignant cells or of invading cells by lymphocytes, leukocytes, depends upon the rate -- rate of lymphocyte production. It has been shown that -- that three grams a day of vitamin C -- this is work done at the National Cancer Institute -- three grams a day doubles the rate of blastogenesis of lymphocytes. Five grams a day triples it. 18 grams a day quadruples it, and there is evidence in the medical literature that the prognosis of a cancer patient is good if he or she has a high rate of blastogenesis of lymphocytes, budding off of new lymphocytes, and poor if the patient has a low rate of blastogenesis.

It's been reported by investigators at Stanford and the Oregon health center that a high intake of vitamin C increases the production of human Interferon.

So in all of these ways, we have a potentiation of the immune system by a high intake of vitamin C.

This may well not be the only ways -- these may not be the only ways in which vitamin C works against cancer. For example, there is very extensive literature on inactivation of viruses by vitamin C in vitro and also, of course, protection against the viral diseases in vivo. And to the extent that viruses are involved in human cancer, this direct inactivation effect might be operating.

Q. Now, Doctor, in the Cameron-Pauling studies which were done in Scotland and reported in your book, can you tell us -- we have a little monograph of your actual chart of your findings. So the record is complete, can you tell us in
summary form what the findings were as to increased longevity of so-called terminal cancer patients beyond the expected with the ingestion of large amounts of vitamin C?

A. Yes. Dr. Cameron and I carried out two statistical studies, both involving essentially the same group of a hundred cancer patients who had been treated with vitamin C, and with as controls a thousand patients in the same hospital who had reached the same stage, the stage called untreatability in Scottish medical practice, and who were matched on the basis of ten to one with a vitamin C patient with respect to age and sex and type of cancer.

The results of each of these two studies was that the control patients died off at a pretty steady rate. The survival curve was just an inverse exponential curve, as found for many populations of cancer patients. And the vitamin C treated patients, about 90 percent of them died off according to this simple exponential law, a constant probability of death each day, but at a rate about three times less; and about ten percent had a very much increased survival of 20 times or more the survival time, so that -- one of the -- one of -- I know one of these original terminal cancer patients was still alive after 12, 13 years, and the others in general of this ten percent that I mentioned have lived several years beyond the expected date of death.

Q. Do you know, Doctor, whether, since the studies that you and Dr. Cameron conducted; other studies have been conducted to test the same theory?

A. Well, Dr. Cameron has been working on another study
involving four hospitals in Scotland in which all cancer patients were entered into the computer. Some of them, essentially at random, were given vitamin C and others were not. And I've just been looking over the results, not yet published. They pretty much bear out the earlier results.

In addition, Dr. Fukumi Morishige in Tokai Hospital in Fukuoka, Japan, carried out a study similar to the original Vale of Leven study in which he compared patients, terminal cancer patients, essentially, who received vitamin C with those who did not receive vitamin C in the same hospital. And with him, as with Dr. Cameron, it depended pretty much on which physician or surgeon was in charge of the patient as to whether the patient received vitamin C or not. The results that Dr. Fukumi Morishige reported were essentially the same as Dr. Cameron's. On the average, these terminal cancer patients who received vitamin C live roughly a year longer than the ones who do not receive vitamin C.

Q. That's an average number that you're giving?
A. That's right, and this is for patients who have already been put in the essentially hopeless category. In Scotland, they are called untreatable because it's felt that all the conventional treatments have been applied to them and no longer were successful.

Q. Moving from the untreatable to the not yet diagnosed, are there any studies of which you are -- with which you are familiar, Doctor, which deal with the question of the role of vitamin C in preventing the onset of cancer?
A. There are a good number of epidemiological studies that
have been reported, mainly about the relation between high vitamin C foods -- intake of high vitamin C foods and incidence of cancer of different sorts, colon cancer, stomach cancer, other cancers.

The results are -- for example, Dr. Bjelti in Oslo carried out studies of this sort with many thousands of subjects in Norway and with 24,000, I think, in Minnesota, where he took his doctor's degree. The results are that there's a considerably lower incidence of cancer in the sub-populations with a high intake of high vitamin foods than those with a low intake of high vitamin foods.

Our epidemiologist -- I say "our epidemiologist." He works mainly with the -- with UCLA --

Q. When you say "our," you mean one in association with the Pauling Institute?

A. -- but he has an association with the Pauling Institute, James Enstrom. Dr. James Enstrom, the epidemiologist who carried out the studies on Mormons -- death rates of Mormons in Utah and California, he and I published a paper on the mortality -- age-standardized mortality of a sub-population that has a high intake of vitamin C, between one and two grams a day, as compared with the population as a whole -- the white population of California as a whole or of the United States.

The results are that this sub-population has approximately half the age-standardized death rate of the control populations. One might question whether the sub-population that receives a high intake of vitamin C was not a selected population. It consisted of subscribers to

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Prevention magazine who had answered -- who filled out a questionnaire, so that it's a selected population.

Q. It may well be that by practicing or following principles of medical preventics, there are other factors in addition to the vitamin C that prolongs their life.

A. That's right. We have examined the data -- statistical data to see if we could find a significant correlation between the amount of vitamin C that the subjects stated they had been taking and the death rate from cancer, but we didn't find a statistical correlation. The number of deaths was about 75. There weren't enough people involved in the study, some 600, to give a statistically significant answer there. So we are engaged in another epidemiological study with some 20,000 people now, which will take several years before we are able to analyze it with the hope of getting something significant.

Q. Now, moving from the non-diagnosed and we've discussed the untreatable, are there any studies that deal with people who have a diagnosed cancer still in the treatable stage and the efficacy, if any, of vitamin C in large doses with that population?

A. The -- I don't think that results of any study have been published as of yet. Before Dr. Cameron left Vale of Leven Hospital two years ago where he had been chief surgeon for some 25 years and came to our institute in Palo Alto, he was trying to set up a study under which cancer patients were put on ten grams of vitamin C a day at first presentation in the hospital, when they were first diagnosed as having cancer. In the course of time, something may come out of that effort.

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Q. Is there scientific validity based on the studies of the untreatables and the population of those who have not yet been diagnosed with cancer -- from a scientific point of view, is it scientifically valid to hypothesize that it is appropriate to treat a patient presenting a new cancer, a recently diagnosed cancer with large doses of vitamin C?

A. Well, I believe I've essentially answered that question before by saying that I am convinced from analysis of a large number of facts that the proper intake of vitamin C for a human being in general is around 10 or 20 grams per day for an adult, and I believe that this puts people in such -- so much better health that the morbidity of various diseases and the mortality from all causes, except automobile accidents perhaps, but that's from mortality from disease, would be really significantly diminished.

Now, for cancer patients, since cancer causes so much suffering, I think that it is especially important that the general health of the patient be improved by proper nutrition, and this means by a proper intake, not only of vitamin C, but also of other vitamins.

Q. There has been testimony from another witness, Doctor, from two other witnesses, relating to negative effects of ingestion of large amounts of vitamin C. If I might briefly review them, and then we'll deal with them one at a time, but let's deal with them as we reach them. The first, there was testimony that a Dr. Victor Herbert and a Dr. Jacobs, I believe, had conducted studies that indicated that vitamin C was contraindicated because it destroyed vitamin B-12 in the
body. Are you familiar with those studies?
A. Yes.

Q. Have you done an analysis of the scientific method employed in the Victor Herbert study?
A. Yes, I examined his published paper, and I've even talked with Dr. Herbert about it.

Q. And what are the -- what is the validity of his study and if you find it to be invalid, why?
A. Well, it was clear --

MRS. HERSH: Excuse me. May we have a citation on that?
MR. BURGESS: On which?
MRS. HERSH: The Victor Herbert study.
MR. BURGESS: One of your witnesses, Dr. -- a gentleman from Stanford, Dr. Sampson testified to it.
MRS. HERSH: Yes. Do you have the study?
MR. BURGESS: I don't have it here, no. I assumed you had it when you utilized it.


BY MR. BURGESS: Q. All right, Doctor. Could you tell us what you found about the study and what its defects were, if any?
A. Well, from the numbers in the published paper, one could see that there was something unusual about the investigation. The composition of the breakfast which was not eaten, but was studied in the laboratory, was such that by reference to the food tables one could find out how much vitamin B-12 the breakfast contained. But Dr. Herbert, Dr. Jacobs had reported
only about ten percent -- less than ten percent that much vitamin B-12. It was clear that something was wrong with their study.

Later investigators, Dr. Numark (phonetic), I remember, and his associates and one other group -- I've forgotten the names of the investigators -- found that if they repeated the Herbert and Jacobs procedure, they got essentially the same results. But if they used the approved standard procedure for isolating -- separating the vitamin B-12 from the food and determining the amount of B-12, then they found that the food contained far more vitamin B-12 than Jacobs and Herbert reported and that it was not destroyed by the vitamin C, except for a few percent destruction.

So the conclusion that has been generally reached, I think, by scientists is that the -- that Jacobs and Herbert were wrong in saying that vitamin C destroys so much of the vitamin B-12 in the food as to cause the possibility or danger of significant B-12 insufficiency, and of course, it wouldn't cause pernicious anemia because pernicious anemia is a kind of B-12 deficiency that results from another defect.

Q. Assuming for purposes of argument that the Herbert/Jacobs studies are sound, is there some way of compensating for that by increased ingestion of B-12?

A. Well, the vitamin B-12 in the food is hydroxocobalamin; the vitamin B-12 in vitamin tablets is cyanocobalamin, which is much more stable and is not destroyed even in small amounts by vitamin C. Consequently, if someone were to take even an ordinary vitamin supplement, he would be protected. But I
don't like this -- this supposition --
Q. I understand that.
A. -- anyway because vitamin B-12 doesn't -- I mean, vitamin C does not destroy a significant amount of the B-12 in foods.
Q. Now, let's turn to the quite common -- in some of the literature that is introduced here, some references to the impact of vitamin C on the formation of kidney stones. Are you familiar with that work, Doctor?
A. Yes.
Q. And what's your analysis of the status or the validity of that assertion?
A. Well, vitamin C is the ascorbate ion. You can't ever take pure vitamin C because the ascorbate ion has a negative charge and you can only get electrically neutral substances. So you are always taking some hydrogen ion or sodium ion or calcium ion or other positive ion along with the ascorbate ion. The ascorbate ion has a general beneficial -- beneficial effect on the urinary tract. Hydrogen ion is beneficial in the case of the ordinary sorts of kidney stones. It's been known for many years that acidifying the urine is a way of protecting against the common sort of kidney stones, which tend to form in alkaline urine. With the less common forms of kidney stones, urate or cysteine stones, they tend to form in acidic urine; and if you take your vitamin C as ascorbic acid, you are protected to some extent against the common kidney stones. If you take it as sodium ascorbate, which alkalinizes the urine, you are protected against these uncommon forms of kidney stones.
Very few -- first, kidney stones aren't common, don't occur very often, but very few people know what kind they are apt to form. If they did, they could take an acidifying -- something that acidifies the urine, such as ascorbic acid or mandelic acid or ammonium chloride and help protect against them or they could take sodium ascorbate or sodium bicarbonate to protect against the other forms.

There has been a suggestion also that taking large amounts of vitamin C increases the amount of oxalate excreted in the urine. There was a study reported from an investigator in Vermont many years ago -- I've forgotten his name -- to the effect that with a low intake of vitamin C, an ordinary adult excretes about 40 milligrams of oxalate in his urine.

MRS. HERSH: Excuse me, Doctor. I'm sorry. I would have to object to this, your Honor. There was no testimony about oxalate production.

ADMINISTRATIVE LAW JUDGE KENDALL: Suppose you go to your next question, Mr. Burgess.

MR. BURGESS: Well, it was anticipated. That was going to be the next question.

Q. So to make the record complete, the discussions also relate to altering the oxalate excretion in the urine, Doctor. You were in the middle of it, but we want to make the record fit the question. Could you discuss that?

A. Well, this comes up because some people form calcium oxalate kidney stones, so I was answering the question about kidney stones.

Q. That's right.
A. Well, one of my associates has just completed a study, and I don't remember how many subjects she used in her investigation, Dr. Constance Siao. She reported to me that she did not find this doubling in the amount of oxalate excreted in the urine in patients -- subjects in California.

There's also the question, however, as to whether a high intake of ascorbate that leads to an increased production of oxalate also leads to an increased probability of forming calcium oxalate kidney stones. So far as I'm aware, no one has been reported as having formed a calcium oxalate kidney stone as a result of high intake of vitamin C, and there are many people who have been taking 10 grams a day or 20 grams a day or even larger amounts for years or decades without any observation of increased incidence of kidney stones of oxalate form or any other form.

Human beings differ from one another. There may be a rare person who is harmed in one way or another by vitamin C, but so far as kidney stone formation goes, the chance of forming a kidney stone because of the ingestion of large amounts of ascorbate seems to be pretty small.

MRS. HERSH: Excuse me again, your Honor. I don't want to cut short the witness or anything. We are pressed for time, and I do object to the narrative answers.

ADMINISTRATIVE LAW JUDGE KENDALL: Well, to some extent, it's required for an expert. He can't obviously be restricted to "yes" or "no" answers because he must have a wider scope. I understand your concern. However, I'm going to overrule and allow Dr. Pauling to expand upon his answers to be sure that...
we do have a record.

It may be, Dr. Pauling, that we do get into a time bind on the matter and I may be asking counsel to cut you a little short on some of your answers by directing more questions to you.

THE WITNESS: I can be succinct if you wish me to.

ADMINISTRATIVE LAW JUDGE KENDALL: Preliminarily, please expand upon your answers.

MR. BURGESS: We understand the objection is overruled.

ADMINISTRATIVE LAW JUDGE KENDALL: Yes.

BY MR. BURGESS: Q. Doctor, turning to another aspect of this case, there is testimony in the case on an aspect of the case that relates to two boys from the ages four to five -- four to six, I believe --

MRS. HERSH: I believe that was three to four.

BY MR. BURGESS: Q. -- three to four, who had otitis media, infections of the middle ear. What if anything is your familiarity or experience with the efficacy of vitamin C in dealing with diseases of that type, infectious disease processes common to children in the ears?

MRS. HERSH: Your Honor, I am going to object to that because it's irrelevant. He hasn't been charged with megadoses of vitamin C in regard to the boys.

MR. BURGESS: Your Honor, the chart says specifically that vitamin C, among other vitamins, was used in connection with the boys, and it's highly relevant to show that that wasn't just a random selection. It has a scientifically valid basis.
ADMINISTRATIVE LAW JUDGE KENDALL: Overruled. Go ahead.

BY MR. BURGESS: Q. Remember the question now, Doctor?

A. Well, I'm not a physician. I'm a chemist, a scientist. And I've read the medical literature and made contributions to limited fields of medicine. There's no doubt in my mind that a high intake of vitamin C is essential for protection of the body against infectious diseases, especially through the mechanism of potentiating the immune system and its various aspects.

Q. Now, Doctor, I want you to view this not from the point of view of medicine, but simply from the point of view of chemistry and the related sciences in which you have -- to which you have devoted your life. Is there anything inappropriate about treating a female patient in her early fifties who presents herself with the initial stages of endometrial --

MRS. HERSH: Objection, your Honor. Dr. Pauling, albeit a very distinguished scientist, is not a physician, and I don't think he is qualified to render an opinion on the treatment of a physician.

MR. BURGESS: Could I finish the question, your Honor?

ADMINISTRATIVE LAW JUDGE KENDALL: Let me hear the full question first and then raise your objection without restating it.

BY MR. BURGESS: Q. -- of treating a patient who presents herself in her early fifties with an early stage endometrial cancer, with -- in addition to advising and bringing in consultants in related cancer disciplines, from a scientific
point of view, with causing her to ingest large amounts of vitamin C?

ADMINISTRATIVE LAW JUDGE KENDALL: Wait a minute. There is an objection.

Do you renew your objection?

MRS. HERSH: Yes, I do.

ADMINISTRATIVE LAW JUDGE KENDALL: Overruled. The form of the question calls for the scientific not the medical conclusions of the witness and therefore the question's proper.

You may answer, Doctor.

BY MR. BURGESS: Q. Doctor?

A. My feeling is that it would be improper in the 1980's for a physician with such a patient not to encourage the patient to take very large doses of vitamin C.

Q. Asking you further, Doctor, visualizing two boys four years old, I guess we have agreed, who have a repeated history of infectious diseases of the middle ear, from a scientific point of view, is there anything inappropriate with causing those children to ingest large amounts of vitamin C?

ADMINISTRATIVE LAW JUDGE KENDALL: I assume you have the same objection?

MRS. HERSH: Yes, your Honor.

ADMINISTRATIVE LAW JUDGE KENDALL: The ruling is the same. Overruled. You may answer.

THE WITNESS: Here again, I feel that the facts strongly support the conclusion that every patient of this sort should have his immune system improved as an adjunct to whatever
conventional therapy is appropriate by the ingestion of what are usually considered large amounts of vitamin C and which I consider to be the proper amounts for human beings.

MR. BURGESS: Thank you, Doctor.

ADMINISTRATIVE LAW JUDGE KENDALL: Would you like a brief recess, Mrs. Hersh?

MRS. HERSH: Yes, I think so.

ADMINISTRATIVE LAW JUDGE KENDALL: Let's take ten minutes at this time. It is now not quite a quarter after. Let's resume at 25 after.

(Recess 2:15 to 2:30 p.m.)

ADMINISTRATIVE LAW JUDGE KENDALL: Back on the record. Had you completed your direct examination?

MR. BURGESS: Yes. Thank you, your Honor.

ADMINISTRATIVE LAW JUDGE KENDALL: Take the witness on cross-examination, Mrs. Hersh.

MRS. HERSH: Yes, your Honor.

CROSS-EXAMINATION BY MRS. HERSH

Q. Dr. Pauling, are you a licensed physician in California?
A. No, I'm not.

Q. In any other state?
A. No.

Q. Do you have any formal degrees in biochemistry?
A. No.

Q. And do you have any formal degrees in nutritional sciences?
A. No.

Q. Could you tell us -- you won the Nobel Prize for physical

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chemistry. Could you tell us the year that you won that prize?
A. Well, that was for chemistry, not physical chemistry; for chemistry. In 1954.
Q. And you won a second Nobel Prize. We never really got to that. When did you win the second Nobel Prize?
A. It was awarded in 1963.
Q. And what was that for?
A. It was the Nobel Peace Prize for 1962.
Q. And what was the Nobel Peace Prize in connection with?
A. The Nobel committee that awards the peace prize does not make a formal statement. All the other committees do, but that one does not.
Q. All right. Have you at any time seen the medical records that are involved in this case?
A. No, I have not.
Q. You are not familiar with the twins that were mentioned--
A. No.
Q. -- or with the cancer patient that was mentioned; is that correct?
A. What do you mean by "familiar"?
Q. Do you know --
A. Some couple of months ago, some television interviewer mentioned that patient to me.
Q. What I mean is: Have you seen her medical records?
A. Haven't seen her medical records.
Q. Do you think you are familiar with the standard of practice of medicine in California?
A. I think perhaps I can say yes. I'm not sure. I have some familiarity with it.

Q. Is that basis for your familiarity -- strike that. What is the basis for your familiarity with the standard of practice of medicine?

A. Well, I've been associated with Stanford Medical School for 15 years, have given a good number of lectures in Stanford Medical School. I know many of the physicians there. I have seen patients there, and I've had a smaller amount of contact with other medical schools. I gave the first clinical lecture to medical students in the University of California San Diego when it was just opened.

Q. I take it then though, however, you haven't treated patients?

A. Well --

ADMINISTRATIVE LAW JUDGE KENDALL: Careful, Doctor.

THE WITNESS: I take it, too, I would say.

BY MRS. HERSH: Q. I am going to read you a list of substances, now. Could you please tell me if you have any familiarity with or advocate the use of any of the following in the diagnosis, treatment, alleviation, or cure of any form of cancer?

MR. BURGESS: Objection.

ADMINISTRATIVE LAW JUDGE KENDALL: What grounds, Mr. Burgess?

MR. BURGESS: I'm sure the Board is aware that it is the position of the defense in this case that any of the substances, if they may be taken from the chart, were not
administered for the treatment of cancer, so we object to the --

MRS. HERSH: It is our position that they were, your Honor.

MR. BURGESS: That makes it a disputed issue, and I object to its inclusion in the question.

ADMINISTRATIVE LAW JUDGE KENDALL: Well, at this particular point, you're only asking if he has any familiarity with these substances, so I'll overrule at this particular point --

MRS. HERSH: Yes, exactly.

ADMINISTRATIVE LAW JUDGE KENDALL: -- subject to renewing the motion at an appropriate time, depending upon what the answer may be. It may be totally negative, for all we know.

MR. BURGESS: Thank you.

ADMINISTRATIVE LAW JUDGE KENDALL: Go ahead, Mrs. Hersh.

BY MRS. HERSH: Q. I will read you the list now.

A. Would you repeat the question?

Q. Do you have any familiarity with or do you advocate the use of any of the following in the diagnosis, treatment, alleviation or cure of any form of cancer? The first item is proteolytic enzymes, specifically something called Wobe Mugos enzyme.

MR. BURGESS: Your Honor, I hate to interrupt this dissertation, but I made a mistake. I neglected to object on the proper grounds, which is that the question is multiphased, and it is not possible to give a "yes" or "no" answer that is meaningful because the question has several sub-parts to it.

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ADMINISTRATIVE LAW JUDGE KENDALL: Well --

MR. BURGESS: The form of the question is defective and any answer would be -- any affirmative or negative answer would be clearly misleading.

ADMINISTRATIVE LAW JUDGE KENDALL: Well, I'll overrule on the basis that there was a general question concerning a specific list --

MR. BURGESS: All right.

ADMINISTRATIVE LAW JUDGE KENDALL: -- of individual items which are now being asked.

MR. BURGESS: All right.

ADMINISTRATIVE LAW JUDGE KENDALL: So actually each question is a separate and single question. So go ahead.

THE WITNESS: Could I ask --

ADMINISTRATIVE LAW JUDGE KENDALL: Wobe Mugos, I think, was the question.

THE WITNESS: Could I ask what "familiarity" means, the definition of the word "familiarity"?

ADMINISTRATIVE LAW JUDGE KENDALL: Well --

BY MRS. HERSH: Q. Do you know of these substances, first of all?

ADMINISTRATIVE LAW JUDGE KENDALL: Do you know what that substance is? That would be the preliminary question, and that would be that you are familiar with the substance, if you know what it is.

THE WITNESS: Well, if I have heard or read something about it, is that familiarity? Should I say "yes" or "no"?

ADMINISTRATIVE LAW JUDGE KENDALL: You might indicate
that you've read about it if that's the degree of your familiarity.

THE WITNESS: Well, would you like me to say for each of these substances --

ADMINISTRATIVE LAW JUDGE KENDALL: Yes, she will ask you.

THE WITNESS: -- what I remember about it? I can't --

ADMINISTRATIVE LAW JUDGE KENDALL: Not what you remember about it, but just whether or not you are aware of its existence and whether you know or have ever advocated, you personally, or know of its use in treatment of any type of cancer.

THE WITNESS: Those are two separate questions.

ADMINISTRATIVE LAW JUDGE KENDALL: That's correct.

THE WITNESS: And "familiarity" means do I know of its existence? Is that -- is that good enough?

ADMINISTRATIVE LAW JUDGE KENDALL: Yes.

THE WITNESS: If I know of its existence? I wouldn't call that familiarity myself.

ADMINISTRATIVE LAW JUDGE KENDALL: Well --

THE WITNESS: More --

ADMINISTRATIVE LAW JUDGE KENDALL: Let's go back and start over, Mrs. Hersh. If you will take one substance at a time and ask first if the doctor's familiar with it, what's the extent of his familiarity and so on, so forth.

BY MRS. HERSH: Q. Doctor, are you familiar with proteolytic enzymes?

A. You will first have to tell me what you mean by "familiar."
Q. Do you have any knowledge of proteolytic enzymes?
A. Oh, I know a great deal about proteolytic enzymes.
Q. Specifically, do you know about something called Wobe Mugos enzymes?
A. I think my knowledge of that is limited to my having seen -- seen the name, the words.
Q. So have you ever advocated the use of that in the diagnosis, treatment, alleviation or cure of any form of cancer?
A. Could I answer in some --

ADMINISTRATIVE LAW JUDGE KENDALL: To the extent that you can, Doctor.

THE WITNESS: -- detail?
I believe that I have advocated to cancer patients that proteolytic enzymes taken by mouth might be helpful with digestion and since anorexia and apesia are common among cancer patients, improved digestion may well be beneficial.

BY MRS. HERSH: Q. Well, what are the effects of these kinds of enzymes when they are swallowed?
A. They help to digest proteins in foods.
Q. And are they thereby destroyed by the gastric juices?
A. I beg your pardon?
Q. Are they thereby destroyed by the gastric juices in the stomach?

MR. BURGESS: I have to object to the question. We're in a very technical area, and I think I know where the answer will be going. The problem is that the question first -- the preceding question first discusses proteins and enzymes and

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then the subsequent question says: Are they destroyed in the stomach? You can't possibly -- the witness can't know. I must confess I don't know which the "they" refers to.

ADMINISTRATIVE LAW JUDGE KENDALL: Sustained.

BY MRS. HERSH: Q. Are the proteolytic enzymes, when swallowed, destroyed by the gastric juices in the stomach?
A. Well, there are many proteolytic enzymes. Many of them are stable at pH 1, stable against the action of gastric juices, because their function -- animal proteolytic enzymes function in the stomach and intestines by splitting proteins, breaking them down to amino acids. Other proteolytic enzymes from plant sources might -- might be attacked by gastric juices and digested, so they might function as proteolytic enzymes for only a limited period of time.
Q. Could you tell us what the effects would be of proteolytic enzymes when they're in enema?
A. (No response.)
Q. In enema. When they are taken rectally.
ADMINISTRATIVE LAW JUDGE KENDALL: Do you have any knowledge in that regard, Doctor?
THE WITNESS: I don't believe I have any knowledge in that regard.
ADMINISTRATIVE LAW JUDGE KENDALL: Next question.
BY MRS. HERSH: Q. Do you have any familiarity with a substance called pangamic acid?
A. Yes, a modest familiarity.
Q. Are you also familiar with the pangamic acid being referred to as vitamin B-15?
A. Yes.

Q. Have you ever advocated the use of that in the diagnosis, treatment, alleviation or cure of any form of cancer?

A. I don't think that I have.

Q. Is pangamic acid a vitamin?

A. I don't think that it's been shown to conform to the accepted definition of the word "vitamin."

Q. Have you any familiarity with a substance called Hoxsey's formula?

A. I've read about it, Hoxsey's, H-o-x-i-e-apostrophe s, I think.

Q. It's H-o-x-s-e-y.

A. H-o-x-s-e-y?

Q. Have you advocated the use of that in the diagnosis, treatment, alleviation or cure of cancer?

A. No.

Q. Are you familiar with coffee enemas?

A. Yes.

Q. Have you advocated the use of coffee enemas in the diagnosis, alleviation, treatment or cure of any form of cancer?

A. I have gone so far as to say that I think that coffee enemas have some value. One, that the caffeine might be absorbed into the bloodstream and serve as a stimulant, which might be helpful to the patient. Two, that to clean out the lower bowel by the administration, often, several times a day perhaps, of coffee enemas is probably beneficial to the health. I've gone on to say that I myself think that giving a
large enough amount of vitamin C to flush out the bowels is preferable to the use of coffee enemas, but I'm not saying that coffee enemas have no value to the cancer patient.

Q. Do buttermilk enemas have any value to the cancer patient?

MR. BURGESS: Of course, I assume we have a continuing objection each time the suggestion is made that these were utilized solely for the treatment of cancer.

ADMINISTRATIVE LAW JUDGE KENDALL: You have the continuing objection. The ruling is the same in all instances. The record will so reflect.

MR. BURGESS: Thank you.

THE WITNESS: There might be circumstances under which an enema has value to a cancer patient. I don't see from my knowledge of biochemistry that buttermilk enemas have a special value.

BY MRS. HERSH: Q. Have you any familiarity with a substance called red clover tea, red clover tea?

A. Well, I think I know what red clover is, and I surmise that I know what red clover tea is from the name, but that's all that I can say about it.

Q. Have you ever advocated the use of red clover tea in the diagnosis, treatment, alleviation or cure of any form of cancer?

A. I never have.

Q. And are you familiar with shepherd's purse tea?

A. No.

MR. BURGESS: Wait a minute. What was that?
MRS. HERSH: Shepherd's purse.

MR. BURGESS: Tea?

MRS. HERSH: It was a tea in the --

Q. Are you familiar with apricot pits?

A. Yes.

Q. Have you ever advocated the use of apricot pits in the diagnosis, treatment, alleviation or cure of any form of cancer?

A. No.

Q. Are you familiar with a substance called adrenocortical extract?

A. Yes. I've heard of it.

Q. And have you ever advocated the use of adrenocortical extract in the diagnosis, treatment, alleviation or cure of cancer?

A. No.

Q. Are you familiar with Chaparral tea?

A. Yes.

Q. Have you advocated the use of Chaparral tea in the diagnosis, treatment, alleviation or cure of cancer?

A. No.

Q. Are you familiar with yellow dock?

A. No.

Q. Are you familiar with a substance, benzaldehyde?

A. With benzaldehyde?

Q. Yes.

A. Surely.

Q. Have you advocated the use of benzaldehyde in the
diagnosis, treatment, alleviation or cure of cancer?
A. I have not, no.
Q. Are you familiar with wheatgrass juice?
A. Yes.
Q. Have you ever advocated the use of wheatgrass juice in the diagnosis, treatment, alleviation or cure of cancer?
A. I may have said to someone that I didn't see any harm in drinking wheatgrass juice, that I think in general vegetable and fruit juices have value for patients with cancer in helping in nutrition of patients with cancer.
Q. Are you familiar with licorice?
A. Yes.
Q. Have you advocated the use of licorice in the diagnosis, treatment, alleviation or cure of cancer?
A. No, I have not.
Q. And are you familiar with high colonics?
A. Well, I've heard about them, yes.
Q. Have you advocated the use of high colonics in the diagnosis, treatment, alleviation or cure of cancer?
A. No.
Q. Are you familiar with chelation therapy?
A. Yes.
Q. Have you advocated the use of chelation therapy in the diagnosis, treatment, alleviation or cure of cancer?
A. I don't believe so.
Q. Have you advocated the use of chelation therapy to maintain a person's general health?
A. Well, yes, I think so.
In what context?
A. With older people, perhaps other people, who are having vascular problems. It seems to me to be a sensible alternative to bypass surgery, for example.
Q. Have you ever -- have you had any familiarity with something called the Arthur Immunostatus Differential test?
A. Arthur?
Q. Arthur.
A. No.
Q. Are you familiar with bee pollen?
MR. BURGESS: With what?
MRS. HERSH: Bee pollen.
THE WITNESS: Yes, I know about it.
BY MRS. HERSH: Q. And have you advocated the use of bee pollen in the diagnosis, treatment, alleviation or cure of cancer?
A. No, I have not.
Q. Are you familiar with vitamin D, as in dog?
A. Vitamin D?
Q. Yes.
A. Yes.
Q. Have you ever advocated the use of up to 3200 milligrams of vitamin D per day for the diagnosis, treatment, alleviation or cure of cancer? Excuse me; units of vitamin D.
MR. BURGESS: Wait a minute. Wait. Let's get that question straight. Is it 32 what?
MRS. HERSH: 32 units -- 3200 units; I'm sorry.
THE WITNESS: Up to -- that presumably means of 3200...
units. No, I have not.

BY MRS. HERSH: Q. Are you familiar with the substance vitamin A?

A. Yes.

Q. Specifically, are you familiar with the form of vitamin A called emulsified vitamin A?

A. Yes.

Q. Have you advocated the use of vitamin A in amounts up to 500,000 units per day for the diagnosis, treatment, alleviation or cure of cancer?

A. I'm not sure about -- I don't believe that I have -- I may have expressed an opinion that --

Q. What was that opinion?

MR. BURGESS: Well, I'd like to hear the witness finish the answer before the next question. Go ahead, Doctor.

ADMINISTRATIVE LAW JUDGE KENDALL: Very well. Go ahead, Doctor.

THE WITNESS: I may have expressed the opinion that the administration of very large amounts of vitamin A over a limited period of time, as much as 500,000 units a day, might have value for cancer patients. Five million units taken at one time causes headaches and nausea. 500,000 units does not. 500,000 units taken over -- per day over an extended period causes increased intracranial pressure, headaches and would be troublesome, but I think that increased intake of vitamin A has value for patients with cancer.

BY MRS. HERSH: Q. And what is the basis for your opinion?

A. Well, it is partially medical literature. In the 1940's,
it was reported in the medical literature, especially the
German literature, that high intakes of vitamin A and vitamin
C -- and the vitamin C intakes were not really high, one or
two grams per day; vitamin A, perhaps a hundred thousand units
a day -- had value for cancer patients. And of course, in
recent years, there have been some people treating cancer by
giving very large amounts of vitamin A to the patients. In
our institute, we have done a little work with animals on
vitamin A, but have not yet reached a conclusion about it.
Q. So would you say that this was in an experimental stage
at this point?

MR. BURGESS: Objection. Timeliness of the question.
Not relevant.

THE WITNESS: No.

ADMINISTRATIVE LAW JUDGE KENDALL: As of -- as of right
now or as of 1981?

MRS. HERSH: As of right now or --

Q. Would you say as of right now it is in an experimental
stage with vitamin A studies?

MR. BURGESS: Objection.

ADMINISTRATIVE LAW JUDGE KENDALL: Well, has limited
relevancy, but I'll permit it. It really is not in the time
frame in which we're dealing in the accusation, but go ahead.
Would you consider that an experimental -- that research still
is experimental at this stage, 1984?

THE WITNESS: I would say I'm pretty convinced about the
value of increased intake of vitamin A. I would not -- I
would say that a patient should not be given 500,000 units of
vitamin A day after day for an indefinite period, but for a
limited period of time, it would be worth doing.

ADMINISTRATIVE LAW JUDGE KENDALL: Doctor, that doesn't
really address itself to counsel's question, which is whether
or not you would consider such treatment now as experimental
rather than established scientifically as having some worth.

THE WITNESS: Well, I need to have more of a background
to answer that question.

ADMINISTRATIVE LAW JUDGE KENDALL: In other words, you
can't properly answer that question with the information you
now have?

THE WITNESS: That's right.

ADMINISTRATIVE LAW JUDGE KENDALL: Next question,
Counsel.

BY MRS. HERSH: Q. Are you familiar with vitamin E?
A. Yes.
Q. Have you ever advocated the use of vitamin E in the
diagnosis, treatment, alleviation or cure of cancer?
A. Yes.
Q. And under what circumstances have you done this?
A. I've written about it. I talk to people about it, people
who ask me what they should do in order to be in the best of
health, to cut down the chances of their developing cancer,
and to help control, improve their health in the case of
cancer patients.
Q. And have you advocated large doses of vitamin E for those
purposes?
A. How do you define a "large" dose?
Q. Say 1200 units.
A. Yes, I've advocated 1200 international units, 1200 milligrams of d-alphatocopherol acetate.

Q. There was some testimony yesterday that vitamin E counteracts the toxicity of vitamin A. Could you address yourself to that proposition?

MR. BURGESS: I'm sorry. I didn't hear the question. I apologize. I was talking.

ADMINISTRATIVE LAW JUDGE KENDALL: Read the question back, Miss Ekren, would you please?

(Record read.)

THE WITNESS: Well, I address myself to the proposition by saying that I think it's likely that it has some effect of this sort. I do not know of any sound studies showing the extent to which it does control the toxicity of vitamin A.

BY MRS. HERSH: Q. Oh, getting back to coffee enemas for a moment, are you aware that there are deaths related to the taking of coffee enemas?

A. "Related to." Well, I'll just answer it by saying no.

Q. Thank you. In your paper, "The Orthomolecular Treatment of Cancer, II" -- that is the clinical trial, I guess, of a high dose of ascorbic acid supplement, the second study -- you stated on page 286 as follows: "Ethics rightly prohibit anything approaching experimentation on human subjects, particularly those in the distressing terminal stages of a lethal disease. Every patient in the series here reported was examined by at least one independent clinician, and a patient was only
included in the series if all clinicians agreed that
no form of conventional treatment had the least
prospect of success."

Do you remember that statement?

MR. BURGESS: I think, your Honor, we have to object
unless counsel will show this to the witness. What we're
really doing now is apparently attempting to impeach with a
prior statement, not an inconsistent statement. I may get to
that later. But at least he should be given a copy.

ADMINISTRATIVE LAW JUDGE KENDALL: Is your ground
impeachment?

MRS. HERSH: No.

ADMINISTRATIVE LAW JUDGE KENDALL: If it's not
impeachment, it's not necessary to show him.

Do you have a recollection of that statement?

THE WITNESS: Oh, yes; surely.

ADMINISTRATIVE LAW JUDGE KENDALL: Would you like to see
it in writing?

THE WITNESS: I don't need to.

ADMINISTRATIVE LAW JUDGE KENDALL: Very well. Go ahead.

THE WITNESS: Yes.

BY MRS. HERSH: Q. Do you believe in that principle, Dr.
Pauling?

A. Well, first, the statement "one independent physician,"
that means independent of Dr. Ewan Cameron, my coauthor on
that paper. I believe in that principle. Otherwise, I
wouldn't have written it.

Q. Now, then would you carry out this experimentation with a
woman with early endometrial cancer who had a 90 percent plus chance of cure by surgery and other conventional techniques?

MR. BURGESS: Objection.

THE WITNESS: What --

ADMINISTRATIVE LAW JUDGE KENDALL: Don't answer, Doctor.

What's the ground of your objection?

MR. BURGESS: Well, we were told when this was gone into that it wasn't for the purpose of impeachment. I think clearly now that's what's being developed in view of the earlier answers, that from a scientific point of view, the treatment was appropriate. And second of all, as I understand it, it was the State who objected -- the Attorney General's office who objected to this witness giving medical opinions.

MRS. HERSH: Your Honor, this is on a scientific basis. I have it on his -- I have the statement in his file.

MR. BURGESS: I wasn't aware --

MRS. HERSH: I mean in his article; I'm sorry.

MR. BURGESS: We didn't qualify this witness as an expert in ethics, certainly not medical ethics.

ADMINISTRATIVE LAW JUDGE KENDALL: That's an expression of his personal belief of the ethic involved, not necessarily the medical profession, so I think he can be examined on it, and I'll overrule the objection. You may proceed.

MRS. HERSH: Yes.

THE WITNESS: Well, let me see the statement --

ADMINISTRATIVE LAW JUDGE KENDALL: Please give it to him.

THE WITNESS: -- so I know just what you were referring to.
ADMINISTRATIVE LAW JUDGE KENDALL: Dr. Pauling?

THE WITNESS: Yes?

MR. BURGESS: Would you like to see it? I've read it.

MRS. HERSH: This is the study, Dr. Pauling.

ADMINISTRATIVE LAW JUDGE KENDALL: Off the record.

(Discussion off the record.)

ADMINISTRATIVE LAW JUDGE KENDALL: Mrs. Hersh?

BY MRS. HERSH: Q. Do you have the question in mind? Could you answer the question please?

ADMINISTRATIVE LAW JUDGE KENDALL: Would you like to have the question read back to you, Doctor?

THE WITNESS: No.

ADMINISTRATIVE LAW JUDGE KENDALL: All right.

THE WITNESS: This paper was published in 1974, this paper. And you are asking me now ten years later in 1984 about -- perhaps you had better repeat the question so that I know just what you are asking me about.

BY MRS. HERSH: Q. Okay. Would you perform that same experiment then with a woman with early endometrial cancer who had a 90 percent plus chance of cure by surgery and other conventional techniques?

A. Would you repeat it again? I --

Q. Would you carry out this same experiment with a woman with early endometrial cancer who had a 90 percent plus chance of cure by surgery or other conventional techniques?

A. Well, first, by experiment, you mean the administration of ten grams of vitamin C a day to the patient. That's what this was referring to. For a number of years, the opinion has
been expressed by Dr. Ewan Cameron and me that this is no
longer an experiment, that it is the duty of every physician
to give proper nutrition to every cancer patient no matter at
what stage in the development of the disease the cancer is.
Q. Let me ask you this --
A. And proper nutrition involves ten grams -- in my opinion,
ten grams or even more for a cancer patient of vitamin C per
day. There is overwhelming evidence for that, which I haven't
presented.

For example, the fact that monkeys are given 70 times the
-- it's recognized from the experiments on monkeys, which
require vitamin C, that to be in good health, they need 70
times the RDA of vitamin C per day, 70 times what's
recommended to human beings. So in 1984, I don't consider
this an experiment. I consider it a proper part of the
nutrition of every cancer patient at any stage of the disease
as an adjunct to appropriate conventional therapy.
Q. What about instead of conventional therapy?
A. Well, I think it should be given no matter what the
decision of the patient is about the conventional therapy that
the patient receives. The vitamin C -- the patient should be
encouraged to build up his or her bodily resistance to the
maximum extent possible by good nutrition, and perhaps the
most important part of good nutrition is the ingestion of this
large -- what you consider a large amount of vitamin C.
Q. So you are considering -- today you would carry out that
experiment?
A. I'm saying it isn't an experiment.
Q. You would carry out that same kind of study -- you would use that kind of treatment on this particular kind of patient in lieu of conventional treatment?

MR. BURGESS: Now, we didn't object to the first question of those two, but we do object to the second. The question was: Would you carry out the study, which is in the field of science. We don't object. We have no problem with his answering it. When the question is then changed to treatment, and it's asked of a nonlicensed physician, we object.

MRS. HERSH: Yes, your Honor, I -- I withdraw that question.

ADMINISTRATIVE LAW JUDGE KENDALL: Very well. Objection sustained. The question and the answer will go out.

Mrs. Hersh, I'm having a problem with your time factors. You're asking the witness over a ten year timespan, and you'll bear in mind that in fact you should be posing the question about 1978 through 1980, which was the treatment period in time.

Doctor, let me ask the question: You've indicated as of 1984 you do not believe that there is anything experimental about the dosages that you have indicated as appropriate to maintain nutrition in a patient who has cancer or any other problem, I am assuming. How about 1978 through '80; would your opinion have been the same?

THE WITNESS: Well, I think our papers published in 1976 and 1978 settled the question so far as I'm concerned.

ADMINISTRATIVE LAW JUDGE KENDALL: In other words, you believe it is no longer experimental by 1978?
THE WITNESS: That's right. Our book, I think, came out in 19 -- well, it might have been '79, but in it we say that every cancer patient should get proper nutrition, and this includes at least ten grams of vitamin C per day, to give him or her the best chance of survival, and this is always as an adjunct to appropriate conventional therapy. And of course, the patient has the right to decide pretty much about the therapy. The physician can make recommendations.

ADMINISTRATIVE LAW JUDGE KENDALL: But the patient proposes -- the physician proposes; the patients disposes.

THE WITNESS: (Nodding head up and down.)

ADMINISTRATIVE LAW JUDGE KENDALL: All right.

MR. BURGESS: May the record reflect an affirmative answer to your --

ADMINISTRATIVE LAW JUDGE KENDALL: Yes. Record will reflect that Dr. Pauling nodded his head in response to a statement made to him -- my last statement made to him.

THE WITNESS: Yes.

ADMINISTRATIVE LAW JUDGE KENDALL: Mrs. Hersh?

BY MRS. HERSH: Q. Dr. Pauling, are you aware of other studies that have been done on vitamin C? I believe you testified to that.

Q. Are you familiar with the J. A. Migliozzi study on the effect of ascorbic acid on tumor growth?

A. I think so.

Q. Would you like to see --

MR. BURGESS: Show it to him.

THE WITNESS: I remember that name, but "familiar" is too
strong a word.

BY MRS. HERSH: Q. Now, would you agree that study shows that with megadoses of vitamin C the tumors in guinea pigs grew without regression where low doses showed regression?

A. I beg your pardon?

Q. Would you agree that that is what the conclusion of this paper is?

A. Well, if we have time, I'll read the paper and see.

Q. I thought you were familiar with the paper.

MR. BURGESS: No. He said --

ADMINISTRATIVE LAW JUDGE KENDALL: No, he didn't indicate that he had a familiarity with it.

MR. BURGESS: That he had heard the name.

BY MRS. HERSH: Q. I'm sorry. Are you familiar with the Craig and Moertel study on the failure of high dose vitamin C therapy to benefit patients with advanced cancer?

ADMINISTRATIVE LAW JUDGE KENDALL: Don't answer.

MR. BURGESS: I don't object to this. I want to go back to the last problem. Is that area of inquiry withdrawn or is the doctor going to be given an opportunity --

MRS. HERSH: Your Honor, if he said he was not familiar, I withdraw that.

ADMINISTRATIVE LAW JUDGE KENDALL: You're precluded -- if he's not familiar with the document or the study in question, you clearly are precluded from pursuing it.

MRS. HERSH: I did not hear the answer.

MR. BURGESS: That is withdrawn, okay.

BY MRS. HERSH: Q. Are you familiar with the Craig and
Moertel study?
A. Yes.
Q. Now, this is a double-blind controlled study, correct?
A. Yes.
Q. And it is not exactly your study, but it is a double-blind controlled study. Are you familiar with the conclusions of this study?
A. The authors' conclusions, you mean?
Q. Yes.
A. Yes.
Q. And could you tell us what the conclusions are?
A. No. I can read that paper.
Q. Would you like to see it?

ADMINISTRATIVE LAW JUDGE KENDALL: Would it refresh your recollection about what his conclusions were if you were to look at that document? Would it refresh your recollection, do you believe, about what his conclusions were?

THE WITNESS: Well, I'm sure that if I were to read --

ADMINISTRATIVE LAW JUDGE KENDALL: Suppose you look at it and see if in fact the conclusions are refreshed in your recollection. Go ahead.

BY MRS. HERSH: Q. Does that refresh your recollection?
A. Yes.

ADMINISTRATIVE LAW JUDGE KENDALL: All right.

BY MRS. HERSH: Q. And what were the conclusions that were drawn from that?
A. First, we were unable to demonstrate any statistically significant benefit of high dose vitamin C in selected
patients with advanced cancer.

MRS. HERSH: May I have that back or do you wish to still keep it?

MR. BURGESS: I'm sorry; I didn't hear that.

MRS. HERSH: Do you wish to still -- I wanted to ask some questions from the paper.

ADMINISTRATIVE LAW JUDGE KENDALL: Oh, fine. Would you please hand that back to counsel, please.

BY MRS. HERSH: Q. Thank you. Now, would you agree that this was a finding in direct contradiction to your findings with Dr. Ewan Cameron?

A. No. Do you have my published letter about it?

MRS. HERSH: I have your studies.

MR. BURGESS: He's asking about his published letter of rebuttal to the Craig and Moertel study.

MRS. HERSH: No, I do not. I'm sorry; I do not have a copy.

ADMINISTRATIVE LAW JUDGE KENDALL: I take it then, Doctor, that you did not agree with the authors' conclusions?

THE WITNESS: No, I did not.

ADMINISTRATIVE LAW JUDGE KENDALL: And apparently rebutted them?

THE WITNESS: That's right.

ADMINISTRATIVE LAW JUDGE KENDALL: Or attempted to rebut them at least by your letter.

Next question.

BY MRS. HERSH: Q. Are you familiar with a study by S. Banic called "Vitamin C Acts as a Co-carcinogen to
Methylcholanthrene in Guinea Pigs?  
A. I may have seen it. I don't have a clear memory of it.  
Q. All right. Are you familiar with the study by Newell, Kapp and Romfh called "The Evaluation of Megadose Vitamin Therapy on Experimental Brain Tumor"?  
MR. BURGESS: I didn't get the authors. Who are they?  
MRS. HERSH: Newell, Kapp and Romfh, R-o-m-f-h.  
ADMINISTRATIVE LAW JUDGE KENDALL: You've indicated no familiarity with it, Doctor?  
THE WITNESS: No.  
ADMINISTRATIVE LAW JUDGE KENDALL: That you recall. All right.

BY MRS. HERSH: Q. And are you familiar with a study by Cameron, Grubbs and Rogers called "High Dose Methylprednisone, Vitamin A and Vitamin C in Rats Bearing the Rapidly Growing Morris 7,7,7,7-Hepatoma."  
A. No.  
Q. Are you familiar with a study by Kumar and Axelrod entitled "Circulating Antibody Formation in Scorbutic Guinea Pigs"?  
A. (Shaking head from side to side.)  
Q. Would you say that your views on vitamin C are in the mainstream of scientific thinking?  
A. The rather general opinion about this has been that they are pretty much in the mainstream of scientific thinking, but not of medical thinking until recently. And here I was pleased to hear Margaret Heckler (phonetic), the secretary of Health and Human Services, say that she had heard Dr. Vincent
de Vita (phonetic), the director of the National Cancer Institute, say everything that Dr. Linus Pauling says is true. So that suggests to me that these ideas are getting into the mainstream of medical thinking, too, with respect to at least the National Cancer Institute.

Q. Do you have any difficulty publishing your results in peer-reviewed journals?
A. Yes.
Q. Why?
A. Oh, sort of a bias that the medical profession has against vitamins.

Q. Do you think that the medical profession doesn't believe in vitamins?
A. Oh, I think it's mainly ignorance.

Q. Are you familiar with the recommended daily allowances for vitamins?
A. Yes, I am.
Q. And do you know the difference between that and the minimum daily requirements for vitamins?
A. Yes.
Q. Would you give us your understanding of the difference?
A. Well, there's a committee of the National Academy of Sciences -- National Research Council called the Food and Nutrition Board, which makes statements, recommendations every five years of the RDA's, which are the recommended dietary allowances. The Food and Drug Administration has set up a set of somewhat different numbers that have a different name, which you have mentioned.
Q. The minimum daily requirements?
A. Minimum daily requirements.
Q. And is this -- could you tell us the difference between them?
A. Well, I don't think they differ by more than a factor of two in any case although I'm not sure about that. Usually they're closer together.
Q. And I take it that you don't believe in either of them?
A. Oh, yes, surely, I think that they -- the Food and Nutrition Board has done a very good job in estimating the amounts that are required, as they say, in order to prevent overt manifestations of corresponding deficiencies in most people in what they call ordinary good health.
Q. And are you aware of the fact -- excuse me. Did you finish your answer?
A. Yes.
Q. Are you aware of the fact that the recommended daily allowances are in fact set a great deal higher than the minimum daily requirements?
A. I don't believe that the statement you've made is true with my interpretation of "a great deal higher." A little higher, I would say.
Q. By a factor of five to seven? That is a little higher?
A. You must be talking about something different from what I'm talking about. If you have the numbers, I'd be glad to look at them, but it's something new to me. I may have been confused about the Food and Drug Administration values. I've forgotten what they are called. But I don't remember any set
of vitamin numbers except those that I recommend where there
is such a big difference -- big factor as five to seven.

Q. If there is a vitamin C deficiency -- strike that.

Are you saying that all human beings that take the
recommended daily allowance of vitamin C are therefore lacking
in nutrition that have -- excuse me?

A. What I am saying is that the Food and Nutrition Board
states that the recommended amounts of vitamin C, the RDA, are
enough to prevent overt manifestations of scurvy in almost all
people in ordinary -- what they call ordinary good health.

Q. Now --

A. And they make no statement about the amounts that put
people in the best of health.

Q. The minimum daily requirement for vitamin C is ten
milligrams?

A. Can you give the reference to me for that?

Q. That is the FDA requirement. And the -- excuse me?

A. That isn't the FDA --

MR. BURGESS: That's not right.

BY MRS. HERSH: Q. The recommended daily allowance for
vitamin C is 60 milligrams; is that correct?

A. That's for an adult male, I think, yes.

Q. And that would be about six times the minimum daily
requirement.

A. Well, where did you get the minimum daily requirement?

This is a figure that I'm not aware of.

Q. What is your understanding of the minimum daily
requirement then?
A. I don't have an understanding of it.

Q. The minimum daily requirement -- excuse me. Strike that.

MR. BURGESS: What was just stricken?

ADMINISTRATIVE LAW JUDGE KENDALL: Well, the start of a question.

MRS. HERSH: Start of a question was stricken.

Q. Could you tell me -- well, how do your views differ from the consensus of the medical community insofar as vitamin C is concerned?

A. How am I to assess the consensus of the medical community?

Q. What is your understanding of the consensus of the medical community?

A. The -- it's a complicated one. The assistant dean of Stanford University School of Medicine said to me: You'd be astonished to know how many of these doctors here are taking really large amounts of vitamin C. So from that standpoint I have some evidence that the consensus of the medical community is that these larger doses that I recommend for optimum health are also being ingested by large numbers of physicians. That may be the true consensus.

When it comes to the American Medical Association, that's a different matter. They're just behind the times in their recommendations.

Q. What is the American Medical Association's opinion?

A. I think up until recently, at any rate -- Dr. White has resigned, I guess, or retired. They've just supported the RDA, have continued to say that -- this old statement that
nobody needs -- very few people suffer from vitamin deficiency and need to take supplementary vitamins. If you just eat a balanced diet, that takes care of your vitamin requirements.

Pure nonsense, of course.

Q. But that is the view of the American Medical Association?
A. I think it's still the view of the American Medical Association.

Q. Are you familiar -- you talked about your being introduced to vitamin C in megadoses. Was it in 19 -- in the 1960's or 1970?
A. About 1965.

Q. And who introduced to you that idea?
A. Well, the idea -- this basis of orthomolecular medicine that these substances, the vitamins, have really extraordinary properties came from my reading the papers and books written by Abraham Hoffer and Humphrey Osmond who were then in Saskatoon, Saskatchewan, Canada.

Q. And were those the studies you mentioned about schizophrenia?
A. Yes.

Q. What is the American Psychiatric Association's position on taking megadoses of vitamins for schizophrenia?
A. I'm not sure what their position is now. A few years ago, the American Psychiatric Association appointed a task force on megavitamin and orthomolecular psychiatry, which brought in a statement that might well still be the official position of the American Psychiatric Association. I wrote a rebuttal to it, to this task force report.
Q. And in that rebuttal, did you include the statement that controlled tests can be carried out only by skeptics?

ADMINISTRATIVE LAW JUDGE KENDALL: Only by what?

MRS. HERSH: Skeptics.

ADMINISTRATIVE LAW JUDGE KENDALL: Do you recall making a statement such as that in your rebuttal?

THE WITNESS: Yes; yes. Still my opinion.

BY MRS. HERSH: Q. Are you a skeptic?

A. I'm not -- well, I'm a skeptic, of course, but I'm not a skeptic about vitamin C in relation to cancer, say, or in relation to health in general. I'm a skeptic in a broad sense.

Q. Are you familiar with a Dr. Irwin Stone?

A. Yes.

Q. Are you an admirer of his?

A. Oh, yes, indeed.

Q. And I believe in publications you said that he really turned your attention to vitamin C.

A. Well, my attention had been turned to vitamins in general by Hoffer and Osmond. Irwin Stone stimulated me to take large doses, three grams a day, of vitamin C to control colds and improve my general health. He wrote to me in 1966, I think, about these matters.

Q. Isn't it true that Dr. Stone received his doctorate from Donsbach University?

A. I don't know. He told me that he didn't have a doctor's degree. This is a dozen years ago or more, 15 years ago -- well, a dozen years ago. He said I had called him Dr. Stone.

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and it wasn't justified. But I understand that he has a doctor's degree now. He's a biochemist.

Q. Isn't it true that he is a retired brewing chemist?
A. Yes, he's the man who got all of the breweries to begin putting vitamin C in the beer 40 years ago in order to improve its taste, shelf life.

Q. Isn't it -- did you testify in the Oscar Falconi (phonetic) - U. S. Postal Service case?
A. Yes, I did.

Q. And did Dr. Stone testify there, too?
A. I don't know. Not while I was there. I was only there one afternoon.

Q. Isn't it true that Dr. Stone did testify and said that: "Even those dying from gunshot wounds actually succumb to subclinical scurvy"?

MR. BURGESS: Wait just a minute now. Just a minute. Dr. Stone is not here. We have not called Dr. Stone as a witness. It obviously is entertaining to refute a witness that hasn't been called, but I don't think it's relevant or material, and we object.

MRS. HERSH: I'm going to ask him if he agrees with the statement.

MR. BURGESS: Do that.

ADMINISTRATIVE LAW JUDGE KENDALL: Well, do you know if he made the particular statement counsel has read to you here?

MR. BURGESS: Do you have the statement in mind that counsel read to you?

THE WITNESS: I think I said I didn't even know that he
had testified.

ADMINISTRATIVE LAW JUDGE KENDALL: But do you agree or disagree with the statement that Dr. Stone made?

Read the statement again, if you will, Mrs. Hersh, from testimony in that trial.

MRS. HERSH: The statement is: "Even those dying from gunshot wounds actually succumb to subclinical scurvy."

ADMINISTRATIVE LAW JUDGE KENDALL: Have you ever heard that expression used before?

THE WITNESS: I have heard Dr. Stone make some similar statement, and I know what he means by it; that ordinary people who are getting along on this miserably little bit of vitamin C a day, the RDA of 60 milligrams a day, are in such poor general health that they are apt to die under conditions when a well-nourished and really healthy person would live. I'm pretty sure that's what Dr. Stone was saying the time that I heard him make a somewhat similar statement to this.

ADMINISTRATIVE LAW JUDGE KENDALL: If that was the thrust of his statement, then you do agree with it?

THE WITNESS: That's right. He and his wife were badly injured in an automobile accident, and he and his wife both claimed that the only reason that they lived was that they managed to swig probably surreptitiously very large amounts of vitamin C, and there's a lot to be said for that because the wound-healing properties of vitamin C are very well documented. There's no doubt that vitamin C is required for the synthesis of collagen. Wounds can't heal unless you can synthesize new collagen. So although Dr. Stone is perhaps
sometimes carried away by his enthusiasm, I think he usually has some basis for any statement that he makes.

ADMINISTRATIVE LAW JUDGE KENDALL: You do respect his opinions generally; is that fair to state?

THE WITNESS: Well, he's a great authority on vitamin C. For 40 years his hobby has been to collect all the literature -- only after he retired from his rather pedestrian job as a biochemist with a group of -- a firm that did chemical analyses and biological analyses for breweries was he in a position to throw himself -- throw his weight around the way he's been doing recently. Yes, I think -- I think a lot of him as a -- as a man.

ADMINISTRATIVE LAW JUDGE KENDALL: Mrs. Hersh?

BY MRS. HERSHEY: Q. Do you believe that the basis for all disease is a lack of vitamin C then?

MR. BURGESS: What was that?

BY MRS. HERSHEY: Q. Do you believe that the basis for all disease is a lack of vitamin C?

A. No; no. There are factors of disease. There's -- I think vitamin C is involved in a very significant way with essentially all diseases.

Q. Are you aware that Dr. Stone has said all clinical diseases have as their cause a lack of vitamin C?

A. Well, I've already commented on that, I think. I wasn't aware that he had made that statement, but I've commented on him as -- as an enthusiast. I don't consider myself an enthusiast about vitamin C. I have lots of interests, but I have a lot of knowledge about vitamin C, too.
Q. Dr. Pauling, are you acquainted with Michael Gerber?
A. Yes.
Q. How long have you known him?
A. A few years. I don't remember when I first met him.
Q. How did you become acquainted with him?
A. I don't know.
Q. Are you a member of the Orthomolecular Medical Society?
A. I think I'm one of the founders and am honorary president of it.
Q. Do you know if Michael Gerber is a part of the Orthomolecular Medical Society?
A. I believe he is, yes.

MRS. HERSH: I have no further questions.

MR. BURGESS: I will have some redirect. Perhaps Dr. Pauling would like to take a break or the Panel would.

ADMINISTRATIVE LAW JUDGE KENDALL: Would you like to take a break, Doctor?

THE WITNESS: No, I don't.

ADMINISTRATIVE LAW JUDGE KENDALL: Resume, Mr. Burgess, if you will.

DIRECT EXAMINATION BY MR. BURGESS

Q. Doctor, you were asked about various enzymes and your familiarity with a particular one, Wobe Mugos enzyme. Let's begin at the beginning. First of all, in your work in chemistry, did you become familiar with the function of enzymes in the human organism?
A. Yes.
Q. Could you tell us if enzymes perform an important and
significant function in the human organism?
A. The human organism operates essentially because of enzymes.

Q. Is it inappropriate when presented with a patient with an advanced disease -- with preliminary symptoms and initial diagnosis of a cancerous process to supplement their other dietary intake with certain enzymes?

MRS. HERSH: I presume this has to do with a scientific opinion, your Honor.

MR. BURGESS: It does.

ADMINISTRATIVE LAW JUDGE KENDALL: Very well.

THE WITNESS: Many cancer patients suffer from malnutrition, partially the result of poor appetite, poor functioning of the senses, food doesn't appeal to them, and so on. And it is important then to try to nourish the patient as well as possible. This includes providing enough protein and digesting the protein to give the amino acids necessary to keep the patient's proteins built up, to preserve the nitrogen balance in the body. Giving digestive enzymes can be helpful in this respect by facilitating the digestion of the proteins in the foods that the patient ingests, so I do not object to recommending -- I would not object to recommending that digestive enzymes be given to cancer patients.

BY MR. BURGESS: Q. Now, you were also asked about pangamic or pangamic acid -- we've heard it pronounced both ways during the course of the many days of this hearing -- or so-called vitamin B-15. Does that substance, whether a vitamin or not, have some significance in the human organism?
A. Well, I'm not sure about it. It's present in many foods and can also be obtained as a nutritional supplement. And how valuable it is -- I doubt that it's essential to the human body. I don't remember any investigation having shown pangamic acid deficiency.

Q. It is, on the other hand, available as a food supplement or a nutrient, isn't it?

A. Yes; yes.

Q. You were also asked about coffee enemas and you indicated that they might serve two functions, cleansing or cleaning out the lower bowel and passing caffeine into the bloodstream. Did I understand your testimony correctly?

A. Yes.

Q. Was that your testimony?

A. Yes.

Q. Could you tell us, if you will please, Doctor, in what way these two functions, passing caffeine into the bloodstream and cleansing or cleaning out the lower bowel might be significant in dealing with patients who either were suffering from cancer or the boys who might have been suffering from an infectious process in the ear?

A. Well, I'm not sure that the stimulation from caffeine has much value, but I think that that is something that might occur as a result of coffee enemas, that there would be transmission of caffeine into the bloodstream, and it's well known to be a stimulant. As I say, I'm not sure about its value.

As to cleaning out the contents of the lower bowel, we
I know that the substances in the fecal material are -- are harmful. We know that there are mutagens in this fecal material in human beings which are presumptive carcinogens. There are a lot of waste materials, many of them toxic -- some of them toxic substances, that we want to get out of our bodies, and it's my opinion that it is beneficial not only to a patient but to a person in ordinary health to move this waste material through the body as -- with some expedition, and this process I carry out by taking enough vitamin C to do the job. I think that Max Gerson's coffee enemas may well have been valuable just in that way.

For a cancer patient it may be especially important that there not be this extra load on the body, the burden of having to take care of harmful materials which have been present in the fecal material, but have diffused back into the body. One of the ways in which vitamin C and fiber cut down the incidence of heart disease has been thought to be just that mechanism, that the chole- -- that the bile acids which have been excreted into the contents of the gut are reabsorbed in the lower gut and reconverted to cholesterol. If instead of allowing this reabsorption to take place you flush out the lower bowel, then the studies state concentration of cholesterol is decreased in the body.

So I have felt that this aspect of Max Gerson's treatment of cancer was a valuable one -- had some value, and that the high vegetable -- vegetable juice and fruit juice diet that Max Gerson put his patients on had much additional value, a good bit of it being the vitamins in large amounts that these
Q. You were also asked, Doctor, about red clover tea, shepherd's purse tea, and Chaparral tea. Let me ask you this: Based -- from a chemical point of view, from a scientific point of view, are these various herbal teas significant and do they perform a significant function in getting certain nutrients into the system?

A. Well, I'm not sure what substances are present in those teas. It may be that these herbs have a moderately large amount of vitamin C. Perhaps there may be other substances. We know that valuable drugs have been gotten out of plants; and plants are very diversified, extraordinarily diversified in the nature of the chemical compounds that they produce. It's not a branch of pharmacology that I'm interested in. There are plenty of people who work on drugs, so I concentrate on vitamins, and these herbal trees -- teas, the fact that they are natural, that they're picked in nature, it seems to me is no indication at all that they are valuable to the person, but here I just don't have evidence about it. I haven't been interested in them. It would be a complicated matter, I think, to show that any one of these substances really has value.

Q. Now, when you -- you indicated in response to the Attorney General's question that you were familiar with the substance benzaldehyde and then no further questions were asked. What is the function, if any, of benzaldehyde in the chemistry of the human body?

A. I don't know.
Q. You are familiar with the substance as such; is that right?
A. That's right. It's a well-known chemical substance, and I know a good bit about its chemistry, but not about its biochemistry.

Q. You were asked about chelation therapy, and I'd like to stop there for just a moment and talk about chelation as opposed to as a therapy.

Is chelation a term that is significant in the field of chemistry, Doctor?
A. Oh, yes, it's a chemical term. Was invented by chemists to describe chemical processes.

Q. And what processes does it describe?
A. Well, it describes a process of the capture usually of metal -- of a metal ion by a molecule -- usually an organic molecule, but not always -- a molecule. The many methods of chemical analysis involve the use of chelating agents, and it's possible to separate a mixture of metal ions into the individual metal ions by a proper choice of chelating agents.

Q. As a matter of fact, doesn't your basic textbook on chemistry, which you coauthored, have illustrations of the chelation process in it?
A. Yes, it's an important enough -- even EDTA, ethylenediaminetetraamine -- tetraacetic acid -- I'll say it again -- ethylenediaminetetraacetic acid, which is commonly used for chelation treatment of patients or people, older people, especially, even that is important in chemistry, and it was illustrated in my -- in our book, the book that I wrote.
with my son Peter.

Q. That's a basic text in college chemistry, is it, Doctor?
A. That's right.

Q. Now, in addition to that, Doctor, does chelation -- the principle of chelation used as a therapy have a significance in terms of general wellness and healthiness of human beings?
A. Well, chelation therapy is used for detoxification of heavy metal poisoning. EDTA, ethylenediaminetetraacetic acid, is approved by the Food and Nutrition -- by the Food -- well, by the FDA, I guess it is, for treatment of heavy metal poisoning with lead, mercury, cadmium, so that infusions of a solution of -- intravenous infusion of a solution of this chelating agent is an approved method of treating heavy metal toxicity.

Q. Go ahead. I was going to ask: Does it have a broader use in your judgment based on your experience than simply --
A. Well, from my study of the literature on chelation therapy for vascular problems, I think that it's likely that it has considerably value -- considerable value there. I haven't done any work with it myself except as a chemical substance; not as in a physiological way.

Q. I understand. You were asked --
A. It seems to me to be sensible, but of course, EDTA is not an orthomolecular agent. It's orthomolecular substances that I'm especially interested in. Human beings have not had EDTA in their bodies for hundreds or thousands of generations, as they have with the vitamins. Nevertheless, EDTA treatment seems to me to be likely to be a sensible and valuable part of
Q. You were asked, Doctor, in addition to vitamin C, questions about A, D and E. Without belaboring this and extending your stay here overlong, let me just ask this: Do each of these vitamins have a separate function and role in the total nutritional health of a patient?

A. Well, every one of them is essential to life and health. There are some interactions among the vitamins, some -- there is some evidence that vitamin E deficiency is ameliorated by a high intake of vitamin C, and the other way around, too. And of course, it's known that high intake of folic acid masks some of the manifestations of B-12 deficiency. So they are interrelated, but every one is essential to life.

Q. Is there anything inappropriate about larger than recommended daily allowances of these three drugs to -- from a scientific point of view, to be recommended and ingested by a patient suffering either from cancer or young boys suffering from a chronic infectious disease process?

A. You mentioned three drugs, but we haven't --

Q. I'm sorry. Three vitamins, D, E and A.

A. D, E -- well, I think that I'll repeat that I believe that it is important that people with cancer or infectious disease or other disease be well nourished in such a way as to potentiate their natural protective mechanisms so far as possible; and while we are somewhat uncertain still about what the amounts are that are needed for this purpose, I am quite convinced that RDA's are far too small for this purpose.

Q. You were asked about the Craig and Moertel study and
alluded to your rebuttal to it. Understanding that that was
in written form, do you recall what you found -- as you sit
here, do you recall at least the outline of the defects you
found in the Craig and Moertel study, Doctor?
A. I pointed out that this statement made by the
investigators that they found no statistically significant
difference between the vitamin C group and the control group,
the placebo group, was not true in that there were two -- in
two of their tables, there were attributes that were studied
and reported where there was a statistically significant
difference in favor of the vitamin C subjects. I also pointed
out that in Cameron's study, the study that Cameron and I
described in detail, only four percent of the vitamin C
subjects had received massive doses of chemotherapeutic agents
and that we were convinced that the massive doses of
chemotherapeutic agents taken without a proper intake of
vitamin C damaged the patients to such an extent that they
would not respond well to the vitamin C; whereas in the Craig
and Moertel paper, 88 percent of the patients had received
chemo- -- treatment with cytotoxic, chemotherapeutic drugs.

So the response to that was that Dr. Moertel said that
they would carry out another trial with patients who had not
had their immune systems knocked out with the anticancer
drugs. We still don't -- although Dr. Moertel has made some
informal statements, there still has not been any paper
published on this second trial.

So Dr. Cameron made an additional comment on the Moertel
paper; that there was no analysis made of the blood of the
patients to find out whether the ones who were on the placebo were taking vitamin C on the side, which is a possibility. There is so much knowledge about vitamin C now that patients might take it.

Q. Those are the three basic problems that you and Dr. Cameron found in the study; is that right, Doctor? Those are the three basic problems that you and Dr. Cameron found in the Moertel study?

A. That's right.

MR. BURGESS: Nothing further. Thank you, your Honor.

ADMINISTRATIVE LAW JUDGE KENDALL: Mrs. Hersh?

MRS. HERSH: Just have a few questions.

RECORD-EXAMINATION BY MRS. HERSH

Q. Dr. Pauling, did you know that pangamic acid was never approved by the FDA for any use?

A. I'm not sure --

Q. Go ahead.

ADMINISTRATIVE LAW JUDGE KENDALL: Had you finished your answer, Doctor?

THE WITNESS: I'm not sure whether I had heard that or not. I don't know for sure.

BY MRS. HERSH: Q. Did you -- going again to coffee enemas, you said that coffee enemas -- coffee enemas may clean out the lower bowel. Would enemas in general do the same thing?

A. Yes. Mrs. Straus, Max Gerson's daughter, says that if you don't want to take coffee enemas, leave out the coffee, just take another enema.

Q. Would you think it appropriate to recommend coffee enemas
for earaches?
A. Well, I don't treat patients, but I wouldn't want to comment on the treatment of a patient without knowing more information -- having more information than that he had an earache.
Q. Would you think it appropriate to recommend enemas for three- to four-year-old boys?
A. My understanding is that enemas are given to three- or four-year-old boys, but here this is outside my medical experience.
Q. You were talking about the benefits of chelation therapy. Do you administer chelation therapy to yourself or do you have it administered to yourself?
A. I haven't received chelation therapy. I haven't felt the need for anything except my vitamins. But perhaps when I get old, I'll --
Q. Do you see anything inappropriate in recommending 70,000 units of vitamin A per day for three- to four-year-old boys --
MR. BURGESS: We have to --
BY MRS. HERSH: Q. -- scientifically speaking?
MR. BURGESS: We have to object to that, your Honor, because it suggests that it's a long-term situation, and that's contrary to the facts in this case.
ADMINISTRATIVE LAW JUDGE KENDALL: Objection overruled.
MRS. Hersh: Say over ten days.
ADMINISTRATIVE LAW JUDGE KENDALL: Over a ten-day period approximately 70,000 units per day for three- to four-year-old boys.
THE WITNESS: From the information that I've got from the literature about toxic manifestations of vitamin A, headaches, I would say that -- that this -- that a decision by a physician to give that amount to such a patient for a limited period of time would be justified.

BY MRS. HERSH: Q. Are you aware whether the FDA has issued a warning against chelation therapy as causing deaths?
A. Yes, I think so.
Q. Are you aware that chelation -- that the FDA only approves chelation therapy for heavy metal poisoning?
A. Yes, I think I know the history of chelation therapy, the deaths in an early period when larger amounts were administered more rapidly than during the last 20 or 25 years and the fact that nobody has tried to get the FDA to approve chelation therapy for any treatment other than -- there's been no application to the FDA. That's why they haven't issued an approval of it. Nobody has asked for it.
Q. But yet they've issued a warning that chelation therapy causes deaths.

ADMINISTRATIVE LAW JUDGE KENDALL: Is that correct, Doctor, to your knowledge, that they've issued a warning?

THE WITNESS: Long ago, I think so. But it's the same therapy as they approve for heavy metal poisoning.

BY MRS. HERSH: Q. Getting briefly to the Craig and Moertel study, did you determine in your study whether your controls were taking vitamin C on the side?
A. Dr. -- yes.
Q. There were 1,000 historical patients, weren't there?
They were not extant patients at that time -- at that point?
A. No, that's not true. You haven't read our papers carefully enough.
Q. Aren't your -- aren't your papers criticized for the fact that you did not have an adequate control?
A. Oh, the papers have been criticized for all sorts of reasons. The statement about historical controls is based on the failure to see what we said. We had a thousand controls and, as I recall, about 350 of them were contemporaneous with the vitamin C subjects; and when we made the comparison between the vitamin C treated cancer patients and the 350 contemporaneous controls, the results were the same as when we included the other 650, which meant going back in time to -- a few years, earlier period.
Q. Did the --
A. So that --
Q. I'm sorry.
A. -- if we used only contemporaneous controls, the difference was the same. The survival curves were essentially the same, even a little better, but not significantly better when we used only contemporaneous controls.
Q. Did you have a placebo group in your study?
A. I beg --
Q. Did you have a placebo group in your study?
A. No, we didn't have a placebo group in our studies.
Q. Was the Craig and Moertel study an attempt to duplicate your study?
A. It was described as an attempt to duplicate our study,

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Q. In and of itself though -- strike that.

Was your study a double-blind controlled study?

A. No. Ours was, you might say, a retrospective study. On one of my visits, about 1974, to Dr. Cameron -- I don't know that I should go on, but I'll go on. I've started -- to Dr. Cameron, I said, We should carry out a double-blind controlled trial. Here by this time you have about 60 or more of these terminal cancer patients who have received vitamin C, so why not take 200 patients now and randomly assign them to the treated group and the untreated group and give them all -- give them ten grams of vitamin C per day.

MRS. HERSH: Dr. Pauling, I hate to cut you off, but we're kind of short of time.

MR. BURGESS: Wait just a minute. We've had --

ADMINISTRATIVE LAW JUDGE KENDALL: Dr. Pauling indicated he had some question concerning the relevancy, so I'll sustain the objection.

THE WITNESS: Dr. Cameron said he wouldn't deliberately withhold the vitamin C from 50 or a hundred patients and give them a placebo instead, that his ethical principles wouldn't allow him to do it. And I realized that my ethical -- he was so convinced by that time of the value of vitamin C, and I was too, that I realized that I hadn't been thinking as an ethical person in suggesting it. I had gone in 1973 to the National Cancer Institute and had asked them -- and Vincent de Vita was one of the ten people that I talked with, all in one group.

MRS. HERSH: Your Honor --
ADMINISTRATIVE LAW JUDGE KENDALL: Finish your answer as quickly as possible.

THE WITNESS: They wouldn't. I asked them to carry out a double-blind controlled trial because I said Dr. Cameron won't do it because of his ethical principles.

So we did the best that we could, and I checked very carefully to see if I could find some flaw in what we were doing.

MRS. HERSH: No further questions.

ADMINISTRATIVE LAW JUDGE KENDALL: Anything further?

MR. BURGESS: Two areas.

FURTHER REDIRECT EXAMINATION BY MR. BURGESS

Q. First, you have discussed briefly in response to the Assistant Attorney General's question the question of the chelation deaths. Those deaths occurred some years ago, did they not?

A. I think about 30 years ago.

Q. Was there a distinguished -- are there certain distinguishing factors between the way chelation therapy was administered then and the way it is currently administered in medical practice?

A. Well, my memory is that twice as much EDTA was given in a twelfth of the time, that is, six grams administered in 15 minutes instead of now three grams administered in three hours. This is the best of my memory. And this way of administering it is approved by the Food and Drug Administration for detoxification of heavy metal poisoning.

So a lot has been learned since 30 years ago.
Q. And there have been no applications to approve EDTA therapy as presently administered for other than heavy metal poisoning; is that correct?

A. That's right. The American pharmaceutical house that owned the United States patent rights realized that the rights would expire in seven years, that it would cost more for them to get the application together than they could hope to make from EDTA during the seven years, so they didn't apply. And since no one else has the patent rights, nobody else has applied for it and it costs quite a lot, several million dollars, I guess, to put this together to get FDA approval for a drug, even an old drug for a new use.

Q. Second and last area of inquiry: In response to discussions about Craig and Moertel's studies, you alluded to applications to the National Cancer Institute for grants for double-blind studies. Has the Pauling Institute or have you yourself attempted to develop through the National Institute for Health or National Cancer Institute or other organizations double-blind studies for various theories of vitamin C efficacy in relation to cancer and other diseases?

A. We have applied. We applied some years ago for a grant to permit double-blind studies to be carried out in Strathclyde University in Glasgow, and in Fukuoka Tokai Medical or Hospital in Japan, and our application was turned down. We were going to administer the grants. These people, their ethical -- their knowledge and so on was such that they were willing, the doctors, to carry out the studies.

The National Cancer Institute approached us a few months...
A. I don't remember having said that.

Q. Well --

A. I think I said there that I recommend that people take larger amounts of vitamin E, including cancer patients, but I don't have much information about vitamin E in this respect. We published the results of one study with vitamin E in relation to skin cancer in hairless mice. We -- we got a negative result. We didn't get evidence of a positive effect.

Q. You've discussed with us from a scientific point of view your opinions about chelation therapy for vascular disease.

A. Yes.

Q. Do you have an opinion from a scientific point of view about chelation therapy for the treatment of cancer either by itself or along with other remedies?

A. The -- I don't have the feeling that chelation therapy would have value for patients in general with any kind of cancer and patients of any age. If you have an old patient whose circulation -- who might have some circulatory problems, he might well be able -- I would think he might well be able to resist the cancer more. I think, in general, it's the body's natural protective mechanisms that pull you through if you have cancer. And with some patients, it might be wise to have chelation.

Q. You mentioned your feelings that vitamin A was of value and you used the term "for a limited period." Can you -- a period of time.

A. That's right.
A. Well, yes, I -- I think so. I'll explain that.

Q. Yes.

A. You probably noticed that every time I talked about vitamin C I said "we" believe, Dr. Cameron and I. He's the medical side here. We believe that every patient with cancer at any stage in the disease should be ingesting large amounts of vitamin C; and by "large amounts," ten grams a day or more --

Q. Understood.

A. -- and for the rest of his life or her life. The rest of the statement is as an adjunct to appropriate conventional therapy. And the word "appropriate" is the important word here. I think that there are many patients who are given chemotherapy -- cytotoxic chemotherapy just because the oncologist or the physician doesn't know what else to do. In -- in Scotland, they would just be called untreatable patients, but they are given chemotherapy instead.

So here -- here is a case where I would say I know that there are many patients who are given chemotherapy who should be receiving vitamin C along with the chemotherapy or perhaps vitamin C in place of the chemotherapy.

Dr. Morishige, who is associated with our institute, has been giving larger amounts of chemotherapeutic agents to patients who are getting 20 or 40 grams of vitamin C a day, and they tolerate these larger amounts when they -- while they are getting the vitamin C.

Dr. Moertel, this same Dr. Moertel at the Mayo Institute,
EXAMINATION BY DR. DAVID

Q. When you take ten grams of vitamin C, what form is that in? Is that in the form of a pill? Is that a synthetic vitamin C pill that you take or is it from natural sources?

A. There's practically no vitamin -- Your Honor, my understanding is that I can answer a question from a member of the Board --

ADMINISTRATIVE LAW JUDGE KENDALL: Certainly.

THE WITNESS: -- in a different way from what I would from counsel.

ADMINISTRATIVE LAW JUDGE KENDALL: Well, try. Go ahead.

DR. DAVID: I don't know.

THE WITNESS: I'm just trying -- I'm not in a court of law. I'm just trying to answer a question.

ADMINISTRATIVE LAW JUDGE KENDALL: Certainly.

THE WITNESS: The vitamin C that I take first -- practically all the vitamin C on the market is natural vitamin C made by a pharmaceutical house. The chemists call it natural. It's a small molecule. There is no difference whatever from one vitamin C extracted from lemon juice or some other source.

I carry one gram tablets around; and if I feel tired, I swallow one of them, so I take that part of my vitamin C just any old time during the day. I start out -- most of the
A. The primates are the principal exception. Most — most primates live in tropical valleys where the foods are especially rich in vitamin C. Dr. Jeffrey Born, father of Peter Born, that Dr. Peter Born. Jeffrey Born's a biochemist, dean of a medical school now in Grenada. Jeffrey Born in 1949 pointed out that the gorilla living in the wild eats bamboo shoots and other stuff high in vitamin C and gets about six grams a day. So if you stay in the tropical valleys, you can get quite a lot of vitamin C. So that humans have moved out and they've changed their eating habits and have had to get along or have learned to get along on a pretty small amount. Most animals manufacture vitamin C.

Q. Right. Would you — would your conclusion be then that people who live in the tropics and eat natural fruits or natural sources of food would be more healthy than people who lived in, say, northern Europe or descendants?

A. Yes. They don't develop scurvy and — it's pretty hard to compare the health of one population when all sorts of things are different from one area to another and to attribute it just to a difference in the amount of vitamin C that they get. But no doubt they do get — of course, there are some problems. Here in Brazil a lot of people develop — became blind because of — I've forgotten what it's called. Well, they go —

DR. JUKES: Xerophthalmia. Xerophthalmia.

ADMINISTRATIVE LAW JUDGE KENDALL: Still can't pronounce it.

THE WITNESS: No. Well, at any rate, they go blind.
There's a relation for countries between the income and the longevity --

Q. I guess.
A. -- length of life.

Q. I have a lot of trouble with your basic assumption that people are normally unhealthy --
A. Yes.

Q. -- that you have -- you make the assumption that anyone who doesn't take 10 to 12 grams of vitamin C is unhealthy.
A. That's right.

Q. What evidence do you have that people --
A. Yes.

Q. People live to be over a hundred and have no cancer, no diseases, and they never take --
A. Here I am a chemist, a scientist, and so I make use of scientific argument, and here's one: We know that the hemoglobin of human beings is pretty much like the hemoglobin of all other animals, not quite the same. There are little differences. And the body -- bodily processes that go on in human beings, the biochemistry, is the same for all animals, so I think that if we look at animals, we can get some idea of what's healthy for human beings.

I mentioned that monkeys -- the people who have monkeys, have studied them hard and have decided that monkeys should get an amount of vitamin C corresponding to three or 4000 milligrams a day for a human being. But all these other animals that manufacture their vitamin C, how much do they make? An animal the size of a man makes ten grams a day.
Q. -- than the human.
A. A fruit fly lives two or three days. 70 kilograms of flies manufacture ten grams of vitamin C a day, and yet they live only two to three days. You can't use that argument. Elephants don't live longer than human beings or as long as human beings because -- because they manufacture more vitamin C, I'm sure. Perhaps that's one factor, but there are so many differences between one animal species and another that it's very hard to draw arguments. One argument --
Q. Your basic feeling, Dr. Pauling, is that you don't have any measurement of health, you have no way of showing that you are healthier now than you were before you started taking ten grams of vitamin C?
A. Surely I have. If you get out photographs of me taken 15 years ago and look at them, when I look at them, I say, I look older than I look now.
Q. Okay.
A. Just looking at a person is a way of telling how old he is, and it may be as good a way as any. We don't have any really good way.
Q. One other aspect about -- do you take vitamin C throughout the day or do you take it at one time or -- what's your -- do you know what the -- what I'm getting to is your body is like a chemical factory. There's a certain amount of intake and a certain amount of excretion as well. When you take --
A. Well --
Q. -- one gram of vitamin C, what happens to that in the
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ADMINISTRATIVE LAW JUDGE KENDALL: Mr. Burgess?

MR. BURGESS: We have no further questions of Dr. Pauling.

ADMINISTRATIVE LAW JUDGE KENDALL: May Dr. Pauling be excused?

MR. BURGESS: As far as we're concerned, yes.

ADMINISTRATIVE LAW JUDGE KENDALL: Mrs. Hersh, do you have any reason --

MRS. HERSH: No.

ADMINISTRATIVE LAW JUDGE KENDALL: Thank you very much for your testimony, Dr. Pauling. You're excused. You may remain if you wish. You may leave if you wish. It's your choice. Thank you very much for your testimony.

(Whereupon, the witness was excused.)

ADMINISTRATIVE LAW JUDGE KENDALL: Let's take a ten-minute recess at this time. Come back at ten of please.

(Recess 4:40 p.m. to 4:50 p.m.)

ADMINISTRATIVE LAW JUDGE KENDALL: We'll go back on the record.

MR. BURGESS: We indicated to your Honor and to the Attorney General's office yesterday and again today that we would have no objection to breaking in at this point and calling a rebuttal witness out of time. That was because we had indicated we'd try to squeeze it in late tomorrow afternoon. In view of the recent incident over the tax return, I still have no objection to taking the witness out of time, but it's now five minutes of 5:00. If the witness runs over and we have to pick him up at the end of the afternoon...
addition. So you don't go shooting up, up like this; proportional intake. You level off somewhere, and there's probably a pretty broad flat top to this curve. But to start out, you benefit a lot from some vitamin C supplement, even a little. You benefit more from somewhat more.

Q. Switching to another subject, you said for very large tumors people that were -- the original or one of the first Cameron patients who had a very large tumor of the throat or something, because of vitamin C you got a brisk tumor response or a sluffing --

A. Rejection.

Q. -- or bleeding; the patient hemorrhaged.

A. Yes.

Q. And that kind of goes against the basic understanding of the greater the tumor, the greater the tumor burden on the patient and, therefore, less of an immune response.

You said, too, in later testimony, that you would try to knock down the amount of tumor burden. I don't know if tumor burden was your actual statement.

A. No.

Q. I forget exactly what it was. I guess I have -- the question is: That kind of goes against the general, accepted feeling of how one's body reacts to tumors in that the large tumors you'd have less of a response generally and the smaller tumors you'd have more of a response, and I'm wondering whether the fact is that the large tumor burrowed into a blood vessel of some sort, and that was the cause of the hemorrhage as opposed to hyperimmune response.
Q. So if you were to take high vitamin E and also take vitamin C, wouldn't the two counteract each other? In other words, the vitamin C forms with oxygen free radicals that help break down the proteins; yet vitamin E helps stabilize these very temporary free radicals.

A. Vitamin E is a free radical quencher.

Q. So how do you --

A. They go to different places. The vitamin E is fat soluble. Vitamin C is water soluble. But there's also the complication that vitamin C is itself a free radical quencher, so it both is involved in forming free radicals and in quenching them, and it just means that the human body and living organisms in general are pretty complicated.

Stitch (phonetic) -- Dr. Stitch up in British Columbia, Vancouver, showed -- said that he had evidence that vitamin C forms free radicals, and so it probably is carcinogenic because of free radical formation. Well, it's also a free radical quencher. It probably functions in some parts of the body and certain places, certain cells, in producing these free radicals and other places in -- in destroying them. Makes it a complicated situation.

Q. Would you say there are free radicals that would be of benefit to the body and free radicals that would be of detriment to the body?

A. That's right. I said that I thought that the free radicals produced by vitamin C in these phagocytic leukocytes are beneficial because they permit phagocytic -- that's the mechanism of the phagocytic activity, and that -- I think
expect that for any substance, even the vitamins -- for most of them, we don't know what that limit is. For vitamin A, we do know something about the toxicity and for vitamin B-6, now.

ADMINISTRATIVE LAW JUDGE KENDALL: Mr. Bubb?

EXAMINATION BY MR. BUBB

Q. One question: You mentioned when you take like 12 grams of vitamin C, you have studied yourself; you expel maybe two grams. Have you done any studies about megavitamins in terms of what percent of that is expelled by the body and what is retained?

A. We have studied only vitamin C in this respect. I don't know what the fate is of other vitamins, the water-soluble vitamins or even vitamin E, no.

Q. Okay.

ADMINISTRATIVE LAW JUDGE KENDALL: Mr. Bubb?

BY MR. BUBB: Q. And when you said something to the effect you really cannot adequately fulfill your nutritional needs, especially vitamin C without using supplements, are you saying that just the vitamin C or all vitamins?

A. The feeling -- the conclusion that I reached is that the optimum intake of all vitamins except vitamin K and vitamin D is considerably larger than the RDA, so I have been taking ten times the RDA of vitamin A -- eight or ten times, 25 times the RDA of the various B vitamins, most of them, and 200 -- 75 times the RDA for vitamin E and 200 times the RDA for vitamin C. And the evidence is far from convincing about these numbers.

One thing we know is if you take 50 milligrams a day of
A. No. No. Well, $300,000.00 over what time period? They
give us $100,000.00 per year. We have to sort of squeeze it
out of them, but we've managed to get it for several years
now.

Q. So you have donations of $100,000.00 per year from
Hoffman-La Roche?
A. That's right.
Q. Hoffman doesn't manufacture vitamin --
A. And that's -- that -- there are no strings attached. We
don't have to do anything for them.

MR. BURGESS: Just for the record, I think it should
appear that while that question was being asked, the office of
the Attorney General of the State of California had in its
hand a tax return. I don't know how the State got the
institute's tax return or whether it's appropriate that it had
it, but I want the record to reflect that that was a tax
return being used, and I want it marked for identification.

ADMINISTRATIVE LAW JUDGE KENDALL: Well, I don't know
about marking it for identification.
Is it in fact an income tax return?
MRS. HERSH: It's an income tax return, your Honor.
MR. BURGESS: I think, your Honor, we are entitled to
inquire how it is that the Attorney General of California
happened to have the tax return of a witness.

ADMINISTRATIVE LAW JUDGE KENDALL: I refuse to go into it
at this point, Counsel. We're too far down the line. If you
wish to reserve some argument time -- but as far as
introducing it, you may not. Counsel has indicated she has in