The Genetics of Scurvy and the Cancer Problem

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Scurvy is a very ancient disease and was known to the early Egyptians, Greeks, and Romans. Humans, from the time of their first appearance on this earth, have been constantly plagued by it. Being around for so long, there has been plenty of time to accumulate many misleading half-truths and misinformation about the etiology, incidence, pathology, and the dosages of ascorbate needed to control it. These misorienta-tions have led to the present paradoxical situation where a large segment of the medical profession believes that scurvy is a very rare disease in this country, when actually nearly every patient who visits these doctors is also suffering from an insidious chronic form of scurvy in addition to the complaint that prompted the visit (Stone, 1972).

Before speaking about ascorbate and cancer, I would like to take a brief historical look into how these half-truths and misorientations have lulled an uncritical Medicine into such a state of euphoria about scurvy that a large proportion of physicians are unable to discern the dangers to health in the present situation. This attitude has also been instrumental in retarding the full exploitation of the vast therapeutic potential of ascorbate since it first became available in unlimited quantities some 40 years ago.

Those most responsible for this unusual and hazardous medical paradox are the orthodox nutritionists, who have considered scurvy as their private domain for the past 60 years. They have continuously bombarded Medicine with a barrage of inaccurate hypotheses, half-truths, and questionable data. They started out with a theory in 1912 (Funk, 1912) that provided great health benefits in the first 20 years of its existence. However, they don't realize that all theories have a built-in obsolescence, which is dependent on the results of future research. The research of the past decade on the genetics of scurvy provides a new approach to its etiology and a more sensible rationale for the quantitative daily intake of ascorbate (Stone, 1966). The present indications are that these traditional nutritional ideas have outlived their usefulness and may be potentially dangerous to full health.

The orthodox nutritionists regard scurvy as a simple dietary disturbance

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brought on by the lack of the micro-nutrient, vitamin C, in the foods consumed. Even the term, "vitamin C," is a misnomer, so hereafter it will be referred to as "ascorbate." Their interest in "micronutrients" has led them over the years to conduct very many tests on finding the "minimal daily requirements" for ascorbate to prevent the appearance of the classical symptoms of frank clinical scurvy, about 10 mg a day, but I have not found a single long-term test conducted in the last 40 years for the purpose of determining the optimal daily intake of ascorbate to insure a lifetime of full health.

The research of the past decade has shown that the disease that is now recognized as "scurvy" is really the terminal sequelae of a potentially fatal genetic liver-enzyme disease called "hypoascorbemia." This disease is an "inborn error of carbohydrate metabolism" due to humans carrying a defective gene for the synthesis of the enzyme protein, L-gulonolactone oxidase. It is similar in etiology to the many other genetic-enzyme diseases like PKU, galactosemia, alkaptonuria, and the thousand-odd others. Most of these other genetic conditions are of rather rare incidence, but hypoascorbemia afflicts 100 percent of the population (Stone, 1966a). Future serious research on scurvy should be within the province of medical genetics and not be conducted by nutritionists and home economists (Stone, 1967).

Probably the worst damage that has occurred resulted from their questionable data regarding the proper daily intakes of ascorbate. If you just want to avoid the terminal signs of the disease, then the vitamin-like levels are OK, but if you are interested in fully correcting this human genetic defect, then daily doses of ascorbate of a different order of magnitude are required.

Recent work has shown that during the course of the evolution of the vertebrates there has been an increasing demand and increased production of ascorbate within their bodies as they sequentially progressed from the amphibians through the reptiles, birds, and mammals. Ascorbate's main functions during this evolution were as an antistressor, detoxicant, and to maintain biochemical homeostasis in the internal environment of the animal. A present-day mammal like a 150-pound goat is capable of making 13,300 mg of ascorbate a day (Chatterjee, 1973) to satisfy its daily needs for this metabolite and produces much more under stress. If humans had the intact gene, like most other mammals, it is nearly a certainty that they would be programmed to produce ascorbate in their livers at the same daily order of magnitude as these other mammals—thousands of milligrams a day. For the past 40 years the traditional nutritionists have regarded less than 100 mg a day of ascorbate as more than adequate for human needs.

Over the years they have had their Food and Nutrition Board of the National Academy of Sciences, the agency that sets the dietary standards and runs the nutrition show, consistently lower the Recommended Dietary Allowance, the RDA, for ascorbate. Their latest exploit in 1975 was to lower by 25 percent the already bare subsistence level of 1968. The adult RDA's for ascorbate were 75 mg a day in 1958, in 1968 it went down to 60 mg, and now it is 45 mg (FNB-NAS, 1958, 1968, 1974). If they continue whittling away at this same rate in the future, the RDA will be zero by the year 2000!!

This present RDA of 45 mg a day may delay the appearance of the terminal symptoms of frank clinical scurvy, but it is very inadequate for fully correcting our inborn error of carbohydrate metabolism (Stone, 1974). This long-term poor correction of this genetic defect brings on the lifelong chronic subclinical scurvy, the CSS Syndrome, that develops in a population on these low intakes. It is my belief that this lifelong CSS Syndrome sets the stage for the present high incidence and morbidity of heart disease, cancer, the collagen diseases, kidney diseases, and the many infirmities found

in the senior citizens. It is the only common thread that runs through all these diseases; all the victims of these diseases are also victims of the CSS Syndrome. Only when Medicine learns to correct this CSS Syndrome will we see the long overdue drop in the statistics of our serious medical problems.

Now let us see what the elimination of the CSS Syndrome can do in cancer.

The early work on the use of ascorbate in cancer, going back to 1936, was reviewed in my book, **"The Healing Factor,"** published in 1972 (Stone, 1972a). This work shows a definite link between correcting the CSS Syndrome and cancer. Many of the investigators thinking of ascorbate as a "micro-nutrient" used pitifully small doses in a disease as stressful as cancer, but in spite of this they were able to report some measure of clinical success. During this time there were no we 11-organized and well-financed tests to once-and-for-all determine ascorbate's actual therapeutic potential in this disease.

Doses of 24,500 mg to 42,000 mg of ascorbate were first used in a case of myelogenous leukemia giving complete remission of the disease. This remission was due entirely to the ascorbate, because the doctor in charge of the case stopped the administered ascorbic acid, twice, as an experiment. Each time the patient's temperature rose, he felt ill, and the leukemic symptoms returned. When the ascorbic acid was resumed, the temperature returned to normal within six hours, his malaise disappeared, and the remission reoccurred. This case history was published in the **Medical Times** 22 years ago (Greer, 1954), and you would think that someone in these many years would have tried this harmless megascorbic therapy in the thousands of cases of leukemia that appear each year. A search of the literature has failed to reveal anyone publishing a check on these exciting clinical results.

In 1969, Dean Burk and his group at the National Cancer Institute published in Oncology **a** paper describing their findings that ascorbate would kill cancer cells and was harmless to normal cells (Benade, 1969). The opening sentence reads, "The present study shows that ascorbate (vitamin C) is highly toxic or lethal to Ehrlich ascites carcinoma cells in vitro." They wrote further, "The great advantage that ascorbates . . . possess as potential anticancer agents is that they are, like penicillin, remarkably nontoxic to normal body tissues, and they may be administered to animals in extremely large doses (up to 5 or more gm/kg) without notable harmful pharmacological effects." Let me remind you that 5 g of ascorbate per kilogram of body weight, for a 150-pound adult, amounts to 350 g or 350,000 mg, over three-quarters of a pound.

They further state, "In our view, the future of effective cancer chemotherapy will not rest on the use of host-toxic compounds now so widely employed, but upon virtually host-nontoxic compounds that are lethal to cancer cells of which ascorbate . . . represents an excellent prototype." They also point out that ascorbate was never tested for its anticancer effects by the Cancer Chemotherapy National Service Center, because it was too nontoxic to fit into their screening program. They don't want to test anything unless it helps kill the cancer patient.

A substance like ascorbate that will kill cancer cells and be harmless to normal cells has been a long-term goal of cancer researchers, and in 1969 it looked like it had been achieved. One would expect that a crash research program would immediately be organized to check and extend these observations and obtain clinical data on this breakthrough. That was six years ago and no further papers could be found that were published by the NCI on this important subject. Apparently the work was stopped and dropped like a hot potato. If an intensive crash research program had been instituted in 1969, the cancer problem may have been solved by now, or at least we would know a lot more about the role of megascorbate in cancer.

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In 1973 there appeared a very important paper on a new Orthomolecular approach to cancer and other diseases by Ewan Cameron and Linus Pauling (Cameron and Pauling, 1973). This paper brought up to date earlier work by Dr. Cameron (Cameron, 1966) and showed that ascorbate was a good inhibitor of the enzyme, hyaluronidase. Hyaluronidase is the enzyme that liquefies and breaks down tissues and ascorbate prevents this. All cells are normally imbedded in a thick viscous environment of ground substance, which restrains growth. For cells to grow and proliferate, they release hyaluronidase, which permits the cells to divide, proliferate, and migrate. Proliferation continues as long as hyaluronidase is released and stops when it is inhibited and the tissue environment allowed to return to its normal restraining state. In other words, ascorbate has the potential of slowing down or stopping the growth of cancers. Let me quote a few sentences from this paper. "The hypothesis also indicates a safe and elegant method of control in many inflammatory and auto-immune diseases where, although the individual causes are still unknown, the essential feature is always excessive cell proliferation." "Most important of all, we are led to the conclusion that the administration of this harmless substance, ascorbic acid, might provide us with an effective means of permanently suppressing neoplastic cellular proliferation and invasiveness, in other words an effective means of controlling cancer. Ascorbic acid in adequate doses might prove to be the ideal cytostatic agent." "It is our hope that a thorough trial will be given this safe substance, ascorbic acid, which may turn out to be the most valuable of all substances in the armamentarium of Orthomolecular medicine." "We conclude that ascorbic acid may have much greater therapeutic value than has been generally assigned to it."

Three further papers appeared in this series on this Orthomolecular treatment of cancer, two in 1974 and one in 1975. The first (Cameron and Pauling, 1974) was a further discussion of the rationale for the megascorbic therapy of cancer. The second (Cameron and Campbell, 1974) reported the clinical results of a pilot study of 50 advanced cancer patients receiving mostly 10,000 mg of ascorbate a day either intravenously or orally. Their conclusions were, "Our clinical findings support the general contention that large doses of ascorbic acid enhance natural resistance to cancer. We have found this medication to have definite palliative value in management of terminal 'untreatable' human cancer. We would therefore expect it to have even greater value when used in treatment of earlier and more favorable patients. We believe that, in time, ascorbic acid supplementation will come to be accepted as a standard supportive measure in most , if not all, forms of cancer treatment. We consider that large-scale clinical trials along such lines are now clearly indicated."

The third paper (Cameron et al., 1975) is a case history of a "treatable" cancer in a 42-year-old long-haul truck driver. The diagnosis was malignant lymphoma and arrangements were started to have him treated by orthodox irradiation and cytotoxic chemotherapy. Because of an administrative delay in sending him to the appropriate facility and his rapid clinical deterioration, ascorbate was administered in the hope that the malignant growth could be slowed until conventional treatment could be started. He was given 10,000 mg a day intravenously for the first 10 days and then 10,000 mg a day orally thereafter. The response to the I.V. ascorbate was so dramatic that the patient "claimed to feel quite fit and well and had been transformed from a 'dying' into a 'recovering' situation. Appetite had returned, night sweats had ceased, with a general sense of well-being." The enlarged liver and spleen had receded and other symptoms of the disease rapidly subsided. The 10,000 mg of oral ascorbate was continued for five months and during this time he remained well

and in active employment. At this time, for some unknown reason, the oral ascorbate was stopped. A month later at a routine clinical examination, he was sick and complained of a recurrence of the symptoms. Clinical evidence of return of the disease was obtained. Ascorbic acid at 10,000 mg a day orally was again given, but without the previous dramatic response. Two weeks later the disease had so progressed that he was readmitted to the hospital and given 20,000 mg a day of ascorbate, intravenously, for two weeks and then 12,500 mg a day orally thereafter. A slow and sustained clinical improvement was shown and examination about six months later showed him to be normal in all respects. "The patient remains fit and well, is in active heavy employment, continues to take ascorbic acid 12,500 mg a day and has no evidence of active disease."

This case was described in detail because of the similarities of response to stopping the daily intake of ascorbate as in the case of myelogenous leukemia cited previously. In both patients the cancerous disease was in a state of remission during the large daily intakes of ascorbate and the disease returned as soon as the daily intake of ascorbate ceased. Control of the disease again occurred when the ascorbate was restarted .

In the truck driver's case the response was not so dramatic on reinstituting the ascorbate as in the leukemia case. It is likely that this was due to the fact that the truck driver was getting much less ascorbate than the leukemic; 12,500 mg for the truck driver as against 24,500 to 42,000 mg a day in the leukemic.

12,500 mg of ascorbate a day is a dose that is in the lower fringes of therapeutic effectiveness for a disease that is so serious and stressful as cancer. Daily intakes of ascorbate of at least about 50,000 mg a day will give a more effective therapeutic response as indicated not only by this leukemia case but also by unpublished clinical data of Dr. William Saccoman, discussed later.

Doses of this order of magnitude can be given without fear of toxic responses. Dr. Klenner uses up to 300,000 mg of sodium ascorbate, intravenously, each day in his successful therapy of the viral diseases.

Cameron and Baird in 1973 (Cameron and Baird, 1973) published the important observation that intravenous megadoses of sodium ascorbate will relieve the pain in terminal cancer patients. Five patients on a heavy morphine schedule to control their pain were able to discontinue the morphine entirely within a few days after the 10,000 mg of sodium ascorbate injections were started. A similar pain-killing effect was noted many years ago by Dr. Klenner (Klenner, 1974) in his megascorbic therapy of severe burns and snakebite. No withdrawal symptoms occurred in Cameron and Baird's patients when the morphine was stopped. This would suggest that megadoses of sodium ascorbate might be useful in the control of the drug abuse problem.

The most recent published evidence of the effectiveness of ascorbate appeared in the November, 1975, issue of Surgery (De Cosse, 1975) on the use of oral ascorbic acid in regressing rectal polyps. Only 3,000 mg of ascorbic acid, as a time-release preparation, were given each day. In spite of this low dosage the authors state, "Ascorbic acid reduced the number of rectal polyps in five of eight patients and caused a major reduction of polyps in three others." "We attribute this effect to ascorbic acid. These results suggest that some neoplastic lesions of the colon may be reversible by pharmacological measures." While their clinical results with 3,000 mg were mostly good, there were three patients whose polyps were unaffected by the treatment. These unresponding patients would probably benefit and show polyp regression if their daily ascorbate intake was increased to a level that we now know to be required for dramatic clinical effects. In this particular condition further benefits might occur through the use of 3 percent sodium ascorbate enemas in addition to the oral intake.

Both Dr. Virginia Livingston and Dr.

William J. Saccoman of San Diego have been interested in the use of megadoses of ascorbate in cancer for many years. Dr. Livingston routinely uses it with very good clinical success as an adjunct to other cancer modalities. Dr. Saccoman first used ascorbate in terminal cancer, giving 120,000 mg of sodium ascorbate, as a sterile isotonic parenteral drip solution, a day. He independently observed ascorbate's analgesic properties and was able to take these patients off their heavy, toxic morphine schedule. He obtained some very exciting indications that the tumors were dissolving in these tests, but unfortunately was forced to suddenly and prematurely discontinue this clinical work. It was some time before he was able to return and continue this most promising line of cancer therapy. The following two cases are typical of the results being obtained (Saccoman, 1975). His general procedure is to start the patients on 22,500 mg of ascorbate a day, intravenously, and an oral administration of ascorbic acid and sodium ascorbate to a total of 50,000 mg, or until diarrhea results. He finds the diarrhea clears in a short time and maintains the patients on a total of 50,000 mg of ascorbate daily. The I.V. administration is gradually reduced while at the same time increasing the oral intake to maintain this constant daily total. Eventually the patient is entirely on oral intake and is feeling so well as to be able to continue this inexpensive treatment at home and thus reducing substantially the cost of the medical care. The first noticeable effect of this treatment is an almost immediate improvement in the patient's well-being. The two case histories indicate what can be expected of this harmless, nontoxic therapy.

1. An adult male had bladder cancer which metastasized to the spine at the level of the 10th thoracic vertebra. Surgical removal of this spinal cancer left the patient completely paraplegic. He was put on 50,000 mg of ascorbate and to quote the doctor, "he is now coming along beautifully." There has been a return of bladder and bowel function and the patient is now able to walk with braces. The cancers are under control and dormant. During the day, the patient takes the powdered ascorbic acid and sodium ascorbate, and at bedtime takes eight of the time-release ascorbic acid tablets.

2. An adult woman was diagnosed as having carcinoma of the lung which had metastasized to the thoracic duct. This caused too much fluid to collect in the chest cavity as to interfere with breathing requiring 11 fluid drainages of the chest cavity. This cancerous invasion also caused giant ascites in the abdomen, so big as to cause an umbilical hernia, requiring surgical repair. Three years ago she was put on ascorbate, about 50,000 mg a day, and has been taking it ever since. The fluid in the lung and the ascites cleared and she has no signs of these any more. While the lung tumor is still present and visible in the x-rays, it is starting to calcify and there are no signs of active disease.

I would like to mention one other case, one that is close to home, the daughter of our Program Chairman, Dr. Bernard Rimland (Rimland, 1976). After about six months of undiagnosed malaise, she became so ill and weak that her physician had to immediately have her admitted to a hospital, in June of 1973, with severe acute renal failure. The gallium scan of her kidneys was the worst ever seen by the hospital staff. After a week of tests the diagnosis of Hodgkin's disease was made, which was confirmed and graded during surgery for spleen removal. It was the most severe stage IV-B, with the disease invading the kidneys and liver. Her weight had gone down to 70 pounds from 103 pounds before the illness. The staff doctors gave her less than one year to live.

Shortly after the operation she was started on toxic chemotherapy. Each chemotherapy session made her extremely sick and totally incapacitated for 12 to 24 hours. She was also told that she would lose all her hair, which only further depressed her. On returning

home from the hospital, Bernie put her on a high-ascorbate, high-vitamin and mineral regime, giving 30 g of ascorbate as a mixture of ascorbic acid and sodium ascorbate each day, orally. My time is running short so I can't give you all the details of the beneficial results of this regime as reported by Bernie, but she did not lose her hair and a thorough examination six months after her surgery revealed that there were no signs of the active disease, and best of all she was feeling fine. Both the ascorbate and the toxic chemotherapy have been continued to the present, and she is now a very healthy young lady of 17, who is very active in school with a high scholastic average and a heavy schedule in dramatics and music that would fatigue any so-called "normal" high school student. There can be no doubt that the elimination of the CSS Syndrome in her case not only aided in survival but also speeded recovery and made normal living a reality. This illustrates the necessity for correcting the CSS Syndrome to counteract the toxic systemic effects of current cytotoxic therapy. Other cases of infantile leukemia successfully treated with ascorbate are known to Dr. Rimland, but I just don't have enough time to discuss them.

If a physician has any doubts that the patients coming to them for help have this CSS Syndrome, this can be easily checked by means of a recently developed 10-second dip-stick urine test. It is called C-STIX and is available only from Ames Company in Elkhart, Indiana, and costs $6 for 50 plastic test strips. A C-STIX strip is dipped into a fresh sample of urine for 10 seconds, and the blue color developed by this immersion is compared against a series of blue color standards and the milligrams of ascorbate per 100 ml of urine is directly obtained. Sick people on bare subsistence intakes of ascorbate will either not spillover ascorbate into their urine or if they do it will be in the lower fringes of the test range.

The test is based on the observation made decades ago that if a "healthy" person is given 500 mg of ascorbate, he/ she will excrete about 50 percent of this test dose in a few hours. The observation was good, but it led to serious inaccurate conclusions. This high rate of excretion was assumed to mean that the body was fully "saturated" with ascorbate and that the "excess" was being eliminated. They did not know at the time that the percentage of excretion decreases with increasing test dosages. At 10,000 mg of ascorbate the spillover amounts to only about 20 percent, 8,000 mg remains in the body. So if you try this test don't make this classic mistake. The test is suitable for detecting whether the patient is scorbutic and has the CSS Syndrome. It should not be used in its present form for determining optimal daily intakes of ascorbate. This should be done clinically.

The very simple lesson that Traditional Medicine must learn from the work reported here is that in cancer, as well as in other diseases, the victims are suffering from at least two diseases, of which one is the CSS Syndrome which can be so easily and harmlessly corrected. The full correction of this insidious syndrome by administration each day of the optimal intakes of ascorbate removes the present handicaps on the body's recuperative and detoxifying powers and its normal ability to resist and fight off the disease and heal itself. No improvement in the present disheartening statistics on disease incidence and morbidity can be expected until this lesson is learned and practiced by the bulk of Medicine.

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