

# Observations on the Dose and Administration of Ascorbic Acid When Employed Beyond the Range of a Vitamin in Human Pathology

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*Editors Note: Recently in browsing the Net I ran across Dr. R. Cathcart III's reprint of Dr. F Klenner's pioneering report on ascorbic acid. Dr. Cathcart probably has more experience using ascorbic acid than any other living physician. He discovered how to determine the optimum dose by increasing the amount until the stools become too soft and too much gas developed. He pointed out that the optimum amount varied tremendously depending upon the nature of the disease, the nature of the stress and many other factors. I agree with Bob Cathcart that the report by Klenner deserves wide exposure as an honor to one of our many pioneers, perhaps the first to use huge dosages of vitamin C with safety, and to remind modern physicians that the history of mega ascorbic acid goes back at least forty-five years. We reprint here an abridged version of his article with the permission of James Heffley, PhD, Editor, Journal of Applied Nutrition and the help of Robert Cathcart III, MD (Web site: [www.orthomed.com](http://www.orthomed.com))*

—A. Hoffer

## Introduction: Ancient History and Homespun Vitamin C Therapies

Folklore of past civilizations report that for every disease afflicting man there is an herb or its equivalent that will effect a cure. In Puerto Rico the story has long been told that to have the health tree Acerola in one's back yard would keep colds out of the front door.<sup>1</sup> The ascorbic acid content of this cherry-like fruit is thirty times that found in oranges. Boneset, scientifically called *Eupatorium perfoliatum*,<sup>2</sup> is now rarely prescribed by physicians, but was once was the most commonly used medicinal plant of eastern United States. Most

farmsteads had a bundle of dried Boneset in the attic or woodshed from which a most bitter tea would be meted out to the unfortunate victim of a cold or fever. Having lived in that section of the country we qualified many times for this particular drink. The Flu of 1918 stands out very forcefully in that the Klenners survived when scores about us were dying. Although bitter it was curative and most of the time the cure was overnight. A later assay of this herbal medicine showed, to my delight, that we had been taking from ten to thirty grams of natural vitamin C at one time. Twentieth century man seemingly forgets that his ancestors made crude drugs from various plants and roots, and that these decoctions served his purpose.

## Early Specifications, Action and Dosages

To understand the chemical behavior of ascorbic acid in human pathology, one must go beyond its present academic status either as a factor essential for life or as a substance necessary to prevent scurvy. This knowledge is elementary. This appeared in Food and Life Yearbook 1939, U.S. Department of Agriculture<sup>3</sup>: "In fact even when there is not a single outward symptom of trouble, a person may be in a state of vitamin C deficiency more dangerous than scurvy itself. When such a condition is not detected, and continues uncorrected, the teeth and bones will be damaged, and what may be even more serious, the bloodstream is weakened to the point where it can no longer resist or fight infections not so easily cured as scurvy. It is true that without these infinitesimal amounts, myriad of body processes would deteriorate and even come to a fatal halt."

Ascorbic acid has many important functions. It is a powerful oxidizer and when given in massive amounts, i.e. 50 grams to 150 grams, intravenously, for certain pathological conditions, and run in as fast as a 20 gauge needle will allow, it acts as a "flash oxidizer"<sup>4</sup> often correcting the pathology within minutes. Ascorbic acid is also a powerful reducing agent. Its neutralizing action on certain toxins, exotoxins, virus infections, endotoxins and histamine is in direct proportion to the amount of the lethal factor involved and the amount of ascorbic acid given. At times it is necessary to use ascorbic acid intramuscularly, however, it should be given orally at the same time as well.

If one is to employ ascorbic acid intelligently, some index for requirements must be realized. Unfortunately there exists today "minimum daily requirements." This illegitimate child has been co-fathered by the National Academy of Science and The National Research Council and represents a tragic error in judgement. There are many factors which increase the demand by the body for ascorbic acid beyond so-called scorbutic levels including: age of the individual; habits such as smoking, the use of alcohol, playing habits; sleep, especially when induced artificially; trauma caused by a pathogen, work, surgery or accident; kidney threshold; physiological stress, season of the year; loss in the stool; variations in individual absorption; variations in binders of commercial tablets; body chemistry; drugs; body weight; inadequate storage.

#### Flexible Dosage Standards Explained as Minimal Standards

With ascorbic acid, today's adequate supply means little or nothing in terms of the needs for tomorrow. Based on scant data on mammalian synthesis, available for the rat, a 70 kg individual would produce 1.8 grams<sup>5</sup> to 4.0 grams<sup>6</sup> of ascorbic acid per day in the unstressed condition. Under stress, up to 15.2 grams.<sup>7</sup> Compare this to the the

the 70 mg recommended for daily requirements without stress and the 200 mg for the simple stress of the obstretical patient, and you will recognize the disparity and understand why we have been waging a one man war against the establishment in Washington for 23 years.

#### Ascorbic Acid not Synthesized by Man

Work on mammalian biosynthesis of ascorbic acid indicates that the vitamin C story as is generally accepted represents an oversimplification of available evidence.<sup>6,7,8</sup> It has been proposed that the biochemical lesion which produces the human need for exogenous sources of ascorbic acid is the absence of the active enzyme, l-gulonolactone oxidase from the human liver.<sup>9</sup> A defect or loss of the gene controlling the synthesis of this enzyme in man blocks the final phase in the series for converting glucose to ascorbic acid. Such a mutation could have happened by a virus, radiation or simply chance, thus denying all progenies of this mutated animal the ability to produce ascorbic acid. Survival demanded ascorbic acid from an exogenous source. The inability of man to manufacture his own ascorbic acid, due to genetic fault, has been called hypovitaminemia by Irwin Stone.<sup>10</sup>

#### Various Procedures for Testing for the Vitamin C Levels and Requirements of the Body

Various tests have been employed to determine the degree of body saturation of vitamin C but for the most part they have been misleading. Blood and urine samples analyzed with 2:6 dichlorophenol indophenol will give values roughly seven percent less than when testing with dinitrophenol hydrazine. Gothlin advocates the capillary fragility test which is similar to the tourniquet test of Hess in results. Both can be used to estimate the quantity of vitamin C necessary to maintain capillary integrity.

The intradermal test of Rotter as modified by Slobody<sup>11</sup> is again gaining new recruits. In principle it is the same as the lingual test of Ringdorf and Cheraskin<sup>12</sup> since both are based on the time required to decolorize dye. The lingual test is rapid and simple to perform but it requires a syringe with a 25 gauge needle and a stop watch. This test was helpful in gauging requirements for simple stress but not accurate enough when using needle therapy. Fifteen years ago we developed the Silver Nitrate-Urine test.<sup>13</sup> This test employs ten drops of 5% silver nitrate and ten drops urine which is placed in a Wasserman tube. When read in two minutes it will give a color pattern showing white, beige, smoke gray or charcoal or various combinations of any two depending upon the degree of saturation. We have found this color index test is all one will need for establishing the correct amount of ascorbic acid to use by mouth, by muscle, by vein in the handling of all types of human pathology either as the specific drug or as an adjuvant with other antibiotics or neutralizing chemicals. In severe pathological conditions the urine sample, taken every four hours, must show a fine charcoal like precipitation

#### Role Played by Ascorbic Acid in Intercellular Reactions, Neutralizing, Possibly Controlling Virus Production

In 1935 Stanley isolated a crystalline protein possessing the properties of tobacco mosaic virus. It contained two substances, ribonucleic acid (RNA) and protein. The simple structure characteristic of tobacco mosaic virus was soon found to be a basic property of many human viruses such as coxsackie virus (which I believe to be the cause of Multiple Sclerosis), Echoviruses and polioviruses - they all contain only ribonucleic acid and protein. There exist minor variations. Adenoviruses contain deoxyribonucleic acid (DNA) and protein. Other viruses such as that causing influenza contain added lipid and

polysaccharides. Deoxyribonucleic acid is used to program the large viruses, like mumps, ribonucleic acid is used to program the small viruses, like measles. The role of the protein coat is to protect the parasitic but unstable nucleic acid as it rides the blood highway or lymphatic system to gain specific cell entry. Pure viral nucleic acid without its protein coat can be inactivated by constituents of normal blood. There are several theories as to what happens after cell entry: Once inside a given cell the virus nucleic acid sheds its protein coat and proceeds to modify the host cell by either creating mutations or by directly substituting its own nucleic acid; The infectious nucleic acid, after entering a human cell, retains its protein coat and starts to produce its own type protein coat<sup>14</sup> and viral nucleic acid, so that new units can either depart to enter other cells or by destruction of the cell, thus making the infection more severe. The introduction of a foreign fragment of nucleic acid in the cell-virus interaction approach as postulated by Starr<sup>15</sup> suggests that there can exist cells with partial chromosome make-up and cells with multi-nuclei. Hiliary Kropowski holds that these partial cells are pseudovirions<sup>16</sup> and are found in some tumor-virus infections. A key factor in the Starr-Kropowski thinking is that the cell maintains its biological integrity to support virus development despite the abnormal morphology and genetic deficiency. If these invaded cells could be destroyed or the invader neutralized the illness would suddenly terminate. Ascorbic acid has the capability of entering all cells. Under normal circumstances its presence is beneficial to the cell, however, when the cell has been invaded by a foreign substance, like virus nucleic acid, enzymic action by ascorbic acid contributes to the breakdown of virus nucleic acid to adenosine deaminase which converts adenosine to inosine. The net result is to lead to purines which are extensively catabolized and not to p+urines

which are utilized for further nucleic acid. Ascorbic acid also joins with the available virus protein, making a new macromolecule which acts as the repressor factor. It has been demonstrated that when combined with the repressor, the operator gene, virus nucleic acid, cannot react with any other substance and cannot induce activity in the structural gene, therefore inhibiting the multiplication of new virus bodies. The tensile strength of the cell membrane is exceeded by these macromolecules with rupture and destruction

#### Promptness of Massive Ascorbic Acid in Avoiding Fatal Encephalitis Related to Stubborn Head and Chest Colds

In 1953<sup>17</sup> we presented a case history and films of a patient with virus pneumonia. This patient was unconscious, with a fever of 106.8°F when admitted to the hospital. 140 grams ascorbic acid was given IV over a period of 72 hours at which time she was awake, sitting up in bed and taking fluids freely by mouth. The temperature was normal. Since that time we have observed a more deadly syndrome associated with a virus causing head and chest colds. This is one of the adenovirus striking in the area of the upper respiratory tract with resulting fever, sore throat and eyes, and when in children can cause fatal pneumonia. More often death is indirect by way of incipient encephalitis where the child can be dead in 30 minutes. These are the babies and children found dead in bed and attributed to Sudden Infant Death Syndrome. It is suffocation but by way of a syndrome we observed and reported in 1957<sup>18</sup> which is similar to that found in cephalic tetanus toxemia culminating in diaphragmatic spasm, with dyspnea and finally asphyxia.<sup>19</sup> By 1958<sup>20</sup> we had collected sufficient information from our office and hospital patients to catalog this deadly syndrome into two important stages.

Stage 1. There is always a history of having had the flu which lasted 48 to 96

hours complicated with extreme physical or mental distress; or a mild cold, similar to an allergic rhinitis, which lingered on for several weeks but did not incapacitate the individual.

Stage 2, which is always sudden, will present itself in at least seven forms: Convulsive seizures; Extreme excitability resembling delirium tremens if an adult and with dancing of the eyeballs if a child; Severe chill; Strangling in the course of eating or drinking (bulbar type); Collapse; Stupor; Hemiplegic type. Other findings of this dramatic second stage are: rapid pulse; respiration twice to three times normal and in some cases will be suggestive of air hunger; moderately dilated pupils and in some instances hemiplegic; White blood count running from 6,000 to 25,000 with a high poly count in the differential.

#### *Neurological Changes*

It is apparent that the second stage of this syndrome is triggered by a breakthrough at the site of the blood-brain barrier. The time required for neurological changes to become evident is roughly comparable to the time necessary for similar neuropathology to be demonstrated following a severe head injury. Cerebral edema exists in both conditions. In my practice I start massive ascorbic acid therapy immediately. Physicians must recognize the inherent danger of the lingering head or chest cold and appreciate the importance of early massive vitamin C therapy. I have seen children dead in from 30 minutes to 2 hours because their attending physician was not impressed with their illness upon hospital admission. An autopsy on one of these patients showed bilateral pneumonitis—all one needs to spark a deadly encephalitis.

How does the brain become involved in encephalitis? Some speculate on the pathways in which the virus gains entrance into the brain, summarized as follows:

a) Through the olfactory nerves; Through the portals of the stomach from

material swallowed, either pulmonary or upper respiratory drainage; Direct extension from otitis media or from mastoid cells

b) The blood stream. Arriving in the brain the virus goes through the blood cerebrospinal fluid barrier and/or the blood brain barrier by one of three ways: electrical charge; chemical lysis of tissue; osmosis.

c) Bakay<sup>21</sup> reported that the permeability of the blood-brain barrier can be changed by introducing various toxic agents into the blood circulation. Chambers and Zweifach<sup>22</sup> emphasized the importance of the intercellular cement of the capillary wall in regulating permeability of the blood vessels of the central nervous system. In this syndrome the toxic substance is an adenovirus. Ascorbic acid will repair and maintain the integrity of the capillary wall.

#### Burn Degrees Explained and some Therapy Rational

The pathologic physiology of a burn wound from the moment of the accident is in a state of dynamic change until the wound heals or the patient dies. The primary consideration is the phenomenon of blood sludging originally recognized by Knisely in 1945.<sup>23,24</sup> Initially there is intravascular agglutination of red blood cells into distinctly visible, smooth, hard, rigid, basic masses. Oxygen uptake by the tissues is greatly reduced because of the sludging and therefore reduced rate of flow. Berkeley<sup>25</sup> in 1960 concluded that this phenomenon of sludging or agglutination results in capillary thrombosis in the area of the burn, extending proximally to involve the large arterioles and venules and thereby creating tissue destruction greater than that originally produced by the burn. Anoxia produces added tissue destruction. Lund and Levenson<sup>26</sup> found that after severe burns there is considerable alteration in the metabolism of ascorbic acid as shown by a low concentration of ascorbic acid in the plasma either with the patient fasting or after saturation tests and also low urinary excretion of vitamin C either

with the patient fasting or after the injection of test doses. The extent of the abnormality closely paralleled the severity of the burn. Bergman<sup>27</sup> reported an increase demand for ascorbic acid in burns especially when epithelization and formation of granulation tissue are taking place. Lam<sup>28</sup> also reported in 1941 a marked decrease in the plasma ascorbic acid concentration in patients with severe burns. Klasson<sup>29</sup> although limiting the amount of ascorbic acid to a dose range of 300 mg to 2000 mg daily, in divided doses, found that it hastened the healing of wounds by producing healthy granulation tissue and also that it reduced local edema. He rationalized that ascorbic acid used locally as a 2% dressing possessed astringent properties similar to hydrogen peroxide. He also reported that antibiotic therapy was rarely necessary.

#### Severe burns and related therapy

Harlen Stone<sup>30</sup> suggested the use of gentamicin in major burns to lower the sepsis caused by pseudomonas. Absorption of its exotoxin from the infected burn wound inhibits the bacterial defense mechanism of the reticuloendothelial system. Death can result either from the toxemia alone or from an associated septicemia. We have found that the secret in treating burns can be summarized in five steps:

1. The use of the old covered wagon type cradle when indicated, with three 25 watt bulbs. The patient controls the heat by turning on and off the first bulb as needed to keep warm. No garments or dressings are allowed

2. The employment of a 3% ascorbic acid solution as a spray over the entire area of the burn. The 3% solution is used every 2 to 4 hours for a period of roughly five days

3. The use of vitamin A and D ointment over the area of the burn and this is now alternated, q4h with the 3% ascorbic acid solution

4. The administration of massive doses of ascorbic acid by vein and by mouth. 500 mg per kg body weight diluted to at least 18

c.c. per gram vitamin C using 5% dextrose in water, saline in water or Ringers solution and for the initial injection, run in as fast as a 20 gauge needle or catheter will carry the flow. Cut-downs are frequently necessary and the foot-ankle area is recommended. Vitamin C solution is repeated every 8 hours for the first several days, then at 12 hour intervals. Ascorbic acid, by mouth, is given to tolerance. Loose stools is accepted as this index. Using large doses of ascorbic acid I.V. will necessitate the administration of at least one gram calcium gluconate, daily, to replace free calcium ions removed in the breakdown chemical action as ascorbic acid goes to dehydroascorbic acid, then to ketogulonic acid and later to oxalic acid as the calcium salt

5. Supportive treatment; that is, whole blood and maintaining electrolyte balance.

If seen early after the burn there will be no infections and no eschar formations. This eliminates fluid formation, since the eschar traps will not exist and there will be no distal edema because the venous and lymphatic systems will remain open. There will be no arterial obstruction and no nerve compression. Pseudomonas will not be a problem, since ascorbic acid destroys the exotoxin systemically and locally. Even if the burn is seen late when pseudomonas is a major problem the gram negative bacilli will be destroyed in a few days leaving a clean healthy surface. Ascorbic acid also eliminates pain so that opiates or their equivalent are not required. What has been overlooked in burns is that there are many living epithelial cells in the areas that grossly look like raw muscle. With the use of ascorbic acid these cells are kept viable, will multiply and soon meet with other proliferating units in the establishment of a new integument.

#### Primary and Lasting Benefits in Pregnancy

Observations made on over 300 consecutive obstetrical cases using supplemental ascorbic acid, by mouth, convinced me that failure to use this agent in sufficient amounts in pregnancy borders on malprac-

tice. The lowest amount of ascorbic acid used was four grams and the highest amount 15 grams each day. Requirements were roughly four grams first trimester, six grams second trimester and ten grams third trimester. Approximately 20 percent required 15 grams, each day, during last trimester. Eighty percent of this series received a booster injection of ten grams, intravenously, on admission to the hospital. Infants born under massive ascorbic acid therapy were all robust.

#### How Concerned Should we be About Oxalic Acid and Kidney Stones?

One of the scare weapons used by the critics on high daily doses of ascorbic acid is the oxalic acid-kidney stone hypothesis. In all cases stasis and a concentrated urine appear to be the chief physiological factors. Meakins<sup>31</sup> states that the chief factors in the formation of renal calculi are perversions of metabolic processes, infection and stasis in the urinary tract. There are two schools of thought on stone formation: 1) That there is a central nucleus of colloids on which the crystalloids are precipitated; 2) That the crystalloids are deposited from the urine in which they are present in concentrated solution, in which salt and hydrogen ion concentrations are important factors. In all cases stasis and a concentrated urine appear to be the chief physiological factors. The only way that oxalic acid can be produced from ascorbic acid is through splitting of the lactone ring. The reaction of urine when 10 grams of vitamin C is taken daily is usually pH6. Oxalic acid precipitates out of solution only from a neutral or alkaline solution-pH7 to pH10. Kelli and Silva<sup>32</sup> reported that dehydroascorbic acid is protected *in vivo* from rapid transformation to the anti-scorbutically impotent diketo-gulonic acid from which oxalic acid is derived. Values reported in the literature for normal 24 hour urinary oxalate excretions for humans range from 14 mg to 56 mg. Lamden et al.<sup>33</sup> found in a group of volunteers that the ingestion of 9 grams ascorbic acid daily resulted in oxalate

spills as high as 68 mg for 24 hours and in the controls without extra vitamin C the high was 64 mg for a 24 hour period.

### Some concern answered regarding high dosage of ascorbic acid

Merton Lamden, a biochemist, writing in the *New England Journal of Medicine*, Feb. 11, 1971, expresses grave doubts about the safety of large doses of ascorbic acid taken by mouth. He gives a report by Paterson<sup>34</sup> on the diabetogenic effect of dehydroascorbic acid on rats. Paterson in 1950 employed only the Ketone formula of ascorbic acid, dehydroascorbic acid, which he administered, undiluted, intravenously, in extraordinary amounts. His results were based on giving rats, weighing 100 grams to 120 grams, dehydroascorbic acid in doses from 20 to 50 mg. This transposed to a man weighing 70 kilograms would represent a dose of 3,500 grams—roughly 5,000 grams ascorbic acid. Obviously the work has no relationship with the ingestion of ascorbic acid by humans.

### Diabetes Mellitus Response to 10 grams Ascorbic Acid by Mouth

Over the past 17 years we have studied the effect of 10 grams by mouth, in patients with diabetes mellitus. We found that every diabetic not taking supplemental vitamin C could be classified as having sub-clinical scurvy. For this reason they find it difficult to heal wounds. The diabetic patient will use the supplemental vitamin C for better utilization of his insulin. It will assist the liver in the metabolism of carbohydrates and to reinstate his body to heal wounds like normal individuals. We found that 60% of all diabetics could be controlled with diet and ten grams ascorbic acid daily. The other 40% will need much less needle insulin and less oral medication.

### Observations Following Post-surgery Cases on Blood Plasma Levels of Ascorbic acid.

Deduction is evident of the need for substantial amounts of ascorbic acid prior

to surgery. Plasma levels, recorded before starting anesthesia and after cessation of such inhalants and completion of surgery, remained unchanged. We found, however, that samples of blood taken six hours after surgery showed drops of approximately one-quarter the starting amount and at 12 hours the levels were down to one-half. Samples taken 24 hours later, without added ascorbic acid to fluids, showed levels three-quarters lower than the original samples. Baylor University research team reported similar findings in 1965. Bartlett, Jones<sup>35</sup> and others reported that in spite of low levels of plasma ascorbic acid at time of surgery, normal wound healing may be produced by adequate vitamin C therapy during the post-operative period. Lanman and Ingalls<sup>36</sup> showed that the tensile strength of healing wounds is lowered in the presence of scurvy plasma levels. Schumacher<sup>37</sup> reported that the pre-operative use of as little as 500 mg of vitamin C given orally was remarkably successful in preventing shock and weakness following dental extractions. Many other investigators have shown in both laboratory and clinical studies, that optimal primary wound healing is dependent to a large extent upon the vitamin C content of the tissues.

In 1949, it was my privilege to assist at an abdominal exploratory laparotomy. A mass of small viscera was found glued together. The area was so friable that every attempt at separation produced a torn intestine. After repairing some 20 tears the surgeon closed the cavity as a hopeless situation. Two grams ascorbic acid was given by syringe every two hours for 48 hours and then four times each day. In 36 hours the patient was walking the halls and in seven days was discharged with normal elimination and no pain. She has outlived her surgeon by many years. We recommend that all patients take ten grams ascorbic acid each day. At least 30 grams should be given, daily, in solutions, post-operatively, until oral medication is allowed and tolerated.

### Could Ascorbic Acid have Anti-cancer Features?

Schlegel<sup>38</sup> from Tulane University has been using 1.5 grams ascorbic acid daily to prevent recurrences of cancer of the bladder. He and biochemist Pipkin have been able to demonstrate that in the presence of ascorbic acid, carcinogenic metabolites will not develop in the urine. They suggest that spontaneous tumor formation is the result of faulty tryptophan metabolism while urine is retained in the bladder. Schlegel termed ascorbic acid "an anticancer vitamin." Along this line Glick and Hosoda<sup>39</sup> reported on work by Von Numers and Pettersson that the depletion of mast cells from guinea pigs skin was due to ascorbic acid deficiency. The possibilities indicated are that vitamin C is necessary either directly or indirectly for formation of mast cells, or for their maintenance once formed or both. Ascorbic acid will control myelocytic leukemia provided 25 to 30 grams are taken orally each day.

### Cholesterol not a Problem when Daily Intake of Ascorbic Acid is High

Mention should be made of the role<sup>40</sup> played by vitamin C as a regulator of the rate at which cholesterol is formed in the body; deficiency of the vitamin speeding the formation of this substance. In experimental work, guinea pigs fed a diet free of ascorbic acid showed a 600 percent acceleration in cholesterol formation in the adrenal glands. Take ten grams or more each day and then eat all the eggs you want; that is my schedule and my cholesterol remains normal. Russia has published many articles demonstrating these same benefits.

### Infectious Hepatitis Relieved

Viral hepatitis needs brief mentioning. There are two types: 1) Infectious hepatitis; 2) Needle hepatitis. Physical activity has always been considered to increase the severity and prolong the course of the disease.<sup>41</sup> In Vietnam, Freebern and Repsher showed that pick-and-shovel details had no

effects on the 199 controls as against 199 kept at bed rest.<sup>42</sup> One thing is certain. Given massive intravenous ascorbic acid therapy and patients are well and back to work in from three to seven days. In these cases the vitamin is also employed by mouth as follow-up therapy. Dr. Bauer at the University Clinic, Basel, Switzerland, reported that just 10 grams daily, intravenously, proved the best treatment available.

### Ascorbic Acid Therapy Applied to Various Maladies

We could continue indefinitely extolling the merits of ascorbic acid. Boyd and Campbell<sup>43</sup> reported excellent results in the healing of corneal ulcers even though their massive dose was 1.5 grams daily. One single injection of ascorbic acid calculated at 500 mg per kg body weight will reverse heat stroke. One to three injections of the vitamin in a dose range of 400 mg kg body weight will effect a dramatic cure in Virus Pancarditis. One gram taken every one to two hours during exposure will prevent sunburn. Intravenous injections will quickly relieve the pain and erythema, even the second degree burns when precautions are not taken. One to three injections of 400 mg per kg given every eight hours will dry up chicken-pox in 24 hours. If nausea is present it will stop the nausea.

These injections are usually given with a syringe in a dilution of one gram to five cc fluid. This concentration will produce immediate thirst. This is prevented by having the patient drink a glass of juice just before giving the injection.

Five per cent ointment using a water soluble base will cure acute fever blisters if applied 10 or more times a day and we have removed several small basal cell epithelioma has with a 30 percent ointment. Dr. Virno<sup>44</sup> at the eye clinic, University of Rome, Italy, reported very promising results in glaucoma with a dose schedule of 100 mg per kg body weight taken after meals and at bed hour. He also reported that these

large doses have proved to be safe. In arthritis at least 10 grams daily and those taking 15 to 25 grams daily will experience commensurate benefit. Supportive treatment must also be given. Repair of collagenous tissue is dependent of adequate ascorbic acid. In herpes zoster use two grams vitamin C intramuscularly and 50 mg adenosine-5 monophosphoric acid, aqueous solution, also intramuscularly every 12 hours. In massive shingles ascorbic acid should also be given by vein and always as much by mouth as can be tolerated. Heavy metal intoxication is also reversed with adequate vitamin C therapy.

General all around benefits, that the brain will be clearer, the mind more active, the body less wearied and the memory more retentive, will accrue with a daily dosage of one to ten grams ascorbic acid per day for adults and one gram for each year of life for children under ten.

### Summary

The types of pathology treated with massive doses of ascorbic acid run the entire gamut of medical knowledge. Body needs are so great that so called minimal daily requirements must be ignored. A genetic error is the probable cause for our inability to manufacture ascorbic acid, thus requiring exogenous sources of vitamin C. Simple dye or chemical test are available for checking individual needs. Ascorbic acid destroys virus bodies by taking up the protein coat so that new units cannot be made, by contributing to the break-down of virus nucleic acid with the result of controlled purine metabolism. Its action in dealing with virus pneumonia and virus encephalitis has been outlined. The clinical use of vitamin C in pneumonia has a very sound foundation. In experimental tests monkeys kept on a vitamin C free diet all died of pneumonia while those with adequate diets remained healthy.<sup>45</sup> Many investigators have shown an increased need for ascorbic acid in this condition.<sup>46,47</sup> Brody

in 1953 after studying vitamin C and colds in college students advised that ascorbic acid be given early and often in sufficient amounts. Regnier<sup>48</sup> reporting in review of Allergy found that the larger the dose of ascorbic acid the better were the results. Our findings resulted in a schedule of one gram each hour for 48 hours and then 10 grams each day by mouth. Those under ten at least one gram for each year of life.

### Virus Encephalitis

Virus encephalitis is a deadly syndrome and must be treated heroically with intravenous and/or intramuscular injections of ascorbic acid. We recommend a dose schedule of from 350 mg to 700 mg per kg body weight diluted to at least 18 cc of 5% dextrose water to each gram of C. In small children, two or three grams can be given intramuscularly, every two hours. An ice cap to the buttock will prevent soreness and induration. Ascorbic acid in amounts under 400 mg per kg body weight can be administered intravenously with a syringe in dilutions of 5 cc to each one gram provided the ampule is buffered with sodium bicarbonate with sodium Bisulfite added. As much as 12 grams can be given in this manner with a 50 cc syringe. Larger amounts must be diluted with bottle dextrose or saline solutions and run in by needle drip. This is true because amounts like 20 to 25 grams which can be given with a 100 cc syringe can suddenly dehydrate the cerebral cortex so as to produce convulsive movements of the legs. This represents a peculiar syndrome, symptomatic epilepsy, in which the patient is mentally clear and experiences no discomfort except that the lower extremities are in mild convulsion. This epileptiform type seizure will continue for 20 plus minutes and then abruptly stop. Mild pressure on the knees will stop the seizure so long as pressure is maintained. If still within the time limit of the seizure the spasm will reappear by simply withdrawing the hand pressure. I have seen this

in two patients receiving 26 grams intravenously with a 100 cc syringe on the second injection. One patient had poliomyelitis, the other malignant measles. Both were adults. I have duplicated this on myself to prove no after effects. Intramuscular injections are always 500 mg to one c.c. solution. With continuous intravenous injections of large amounts of ascorbic acid, at least one gram of calcium gluconate must be added to the fluids each day. This is done because we have found that massive doses of ascorbic acid pulls free calcium ions from the vicinity of the platelets or from the calcium-prothrombin complex as the lactone ring of dehydroascorbic acid is opened. The first sign of calcium ion loss is nose bleeding. This differs from the nose-bleed found, at times, in cases of chicken pox or measles. Here it represents frank scurvy from vitamin C deficiency. The pathology being capillary fragility.<sup>49</sup>

### Burns

A new treatment for burns has been outlined, which if followed will eliminate skin grafting and plastic surgery. It is probably too simple to gain early acceptance. The literature has been suggesting the value of ascorbic acid in burns for many years. Proper local application and the amount for systemic usage has been misleading. One only need see one case properly treated with ascorbic acid to appreciate its importance. If ascorbic acid can destroy the exotoxin of tetanus, as Jungeblut demonstrated, it can also destroy the exotoxin of *Pseudomonas*. Ascorbic acid plays an important role in maintaining fluid balance in the body. Ruskin pointed out that the vitamin activates an enzyme arginase, which breaks down the amino acid arginine, resulting in production of urea which is one key to tissue fluid balance.

### Pregnancy

The simple stress of pregnancy demands supplemental vitamin C. This

amount will vary with the individual. The silver nitrate-urine test will simplify these findings. Vitamin C seems especially concerned with mesenchymal tissue. When one considers the demands of the fetus and infant, especially premature babies, it is obvious that high vitamin C intakes are required during pregnancy because this parasite will drain available C from the mother. Greenblatt<sup>50</sup> reports excellent results following the oral administration of vitamin C in the therapy of habitual abortion. In my own practice I was able to take women who had had as many as five abortions without a successful pregnancy and carry them through two and three uneventful pregnancies with the use of supplemental vitamin C. The German literature is stacked with articles recommending high doses of vitamin C during gestation because they believe that this substance is of great benefit in influencing the health of the mother and in preventing infections. The vital contribution of ascorbic acid to the body tissues can be summed up in the formation and maintenance of normal intercellular material, especially in the connective tissue, bones, teeth, and blood vessels. Genetic errors might be prevented if prospective mothers were advised to take 10 or more grams of ascorbic acid daily. It is significant that we found in the simple stress of pregnancy, a normal physiological process, that equivalent requirements paralleled those found in the rat when under stress. Experiments by King et al.<sup>51</sup> have shown that the need for supplemental vitamin C begins with the embryo.

### Diabetes

Large doses of ascorbic acid do not cause diabetes mellitus in humans as has been suggested. On the contrary 10 grams daily, by mouth, has proved to be beneficial. The fact that 10 grams will allow them to heal wounds like normal individuals will save many legs in the future. Lamden, a biochemist, instigated these fears by mis-

interpretation of the results reported by Patterson using the Ketone formula intravenously in rats.

### In Surgery

In surgery the use of ascorbic acid resolves itself into a must situation. The 24 hour frank scurvy levels should be sufficient evidence to encourage all surgeons to use vitamin C freely in their fluids. Proper employment of vitamin C by the surgeons will all but eliminate the post-surgery deaths.

### In Malignancy

The part very large doses of ascorbic acid given intravenously over a prolonged period offers a medical challenge. From cabbage and tomatoes grown in the carbon-14 chambers radioactive ascorbic acid can be extracted, which can be used in tracer studies. At least one research team has demonstrated that in cancer all available C is mobilized at the site of the malignancy. Lauber and Rosenfeld reported that C is mobilized from the tissues of the body and selectively concentrated in traumatized areas. In one hopeless case we administered 17 grams daily for 92 consecutive days without changing the blood or urine levels from that associated with scurvy. This is the reason we believe a dose range of 100 grams to 300 grams daily by continuous intravenous drip for a period of several months might prove surprisingly profitable. Blood chemistry should be followed daily with such an investigation. Schlegel found that even a dose of 1.5 grams a day, by mouth, would prevent bladder cancer.

### Viral Hepatitis

Ascorbic acid is the drug of choice in viral hepatitis. The dose used ranges from 400 mg to 600 mg per Kg body weight, depending on the severity of the disease. It should be given every 8 to 12 hours. Ten grams ascorbic acid daily in divided doses is also given by mouth. Those under 10 years the usual schedule of at least one gram for each year of life.

### Multiple Uses

We have reviewed many other pathological conditions in which ascorbic acid plays an important part in recovery. To these might be added Cardiovascular Diseases, Hypermenorrhea, Peptic and Duodenal Ulcers, Post-operative and Radiation Sickness, Rheumatic Fever, Scarlet Fever, Poliomyelitis, Acute and Chronic Pancreatitis, Tularemia, Whooping Cough and Tuberculosis. In one case of scarlet fever in which Penicillin and the Sulfa drugs were showing no improvement, fifty grams ascorbic acid given intravenously resulted in a dramatic drop in the fever curve to normal. Here the action of ascorbic acid was not only direct but also as a synergist. A similar situation was observed in a case of lobar pneumonia. In another case of purperal sepsis following a criminal abortion the initial dose of ascorbic acid was 1200 mg per kg body weight and two subsequent injections were at the 600 mg level. Along with Penicillin and Sulfadiazine an admission temperature of 105.4 °F was normal in nine hours. The patient made an uneventful recovery. In one spectacular case of Black Widow<sup>52</sup> spider bite in a 3H year old child, in coma, one gram calcium gluconate and four grams of ascorbic acid was administered intravenously when first seen in the office. Four grams ascorbic acid was then given every six hours using a 20 c.c. syringe. She was awake and well in 24 hours. Physical examination showed a comatose child with a rigid abdomen. The area about the umbilicus was red and indurated, suggesting a strangulated hernia. With a 4X lens, fang marks were in evidence. Thirty hours after starting the vitamin C therapy the child expelled a large amount of dark clotted blood. There was no other residual. A review of the literature confirmed that this individual has been the only one to survive with such findings; the others were reported at autopsy. Ten grams vitamin C and 200 mg to 400 mg vitamin B<sub>6</sub>, by mouth, daily will shield one from mosquito bites. Twenty percent will

also require 100 mg vitamin B<sub>6</sub> intramuscularly each week.

### General Nutrition

Vitamin C plays a very important role in general nutrition. Deficiency of this substance in sufficient amounts can be a factor in loss of appetite, loss of weight or failure to grow, muscular weakness, anemia and various skin lesions. The relationship between vitamin C and the health of the gums and teeth has long been recognized. Laboratory studies on gum-teeth connective tissue have reaffirmed this relationship.<sup>53</sup> Our son who will be 19 in July has never developed a tooth cavity. Since age 10 he has received at least 10 grams ascorbic acid, daily, by mouth. Before age 10 the amount given was on a sliding scale.<sup>54</sup>

### Intravenous Application.

Ascorbic acid must be given by needle to bring about quick reversal of various insults to the human body. We have found that doses must range from 350 mg to 1200 mg per kg body weight. Under 400 mg per kg of body weight the injection can be made with a syringe provided the vitamin is buffered with sodium bicarbonate with Sodium Bisulfite added. Above 400 mg doses per kg body weight, and a particular ampule described in this summary, the vitamin must be diluted to at least 18 cc of 5% dextrose in water, saline in water or Ringers solution. Many times Adenosine 5-Monophosphate, 25 mg in children and 50 to 100 mg in adults, given intramuscularly, is necessary to achieve results. The aqueous solution is more effective for quick results, although Adenosine in Gel can be employed. In debilitated individuals or when the pathology is serious, Desoxycorticosterone Acetate (DCA), aqueous solution, must also be added to the schedule. Usually 2.5 mg for children and 5 mg for adults is the daily intramuscular dose required. Sudden swelling of the feet indicates abnormal sensitivity and the drug must be discontinued.

It must be remembered when using ascorbic acid that experiments on man are the only experiments which can give positive evidence of therapeutic action in man. Likewise, the use of ascorbic acid in human pathology must follow the Law of Mass Action: In reversible reactions, the extent of chemical change is proportional to the active masses of the interacting substance.

I am in full agreement with Lancelot Hogben who said, "A scientific idea must live dangerously or die of inanition. Science thrives on daring generalizations. There is nothing particularly scientific about excessive caution. Cautious explorers do not cross the Atlantic of truth."

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