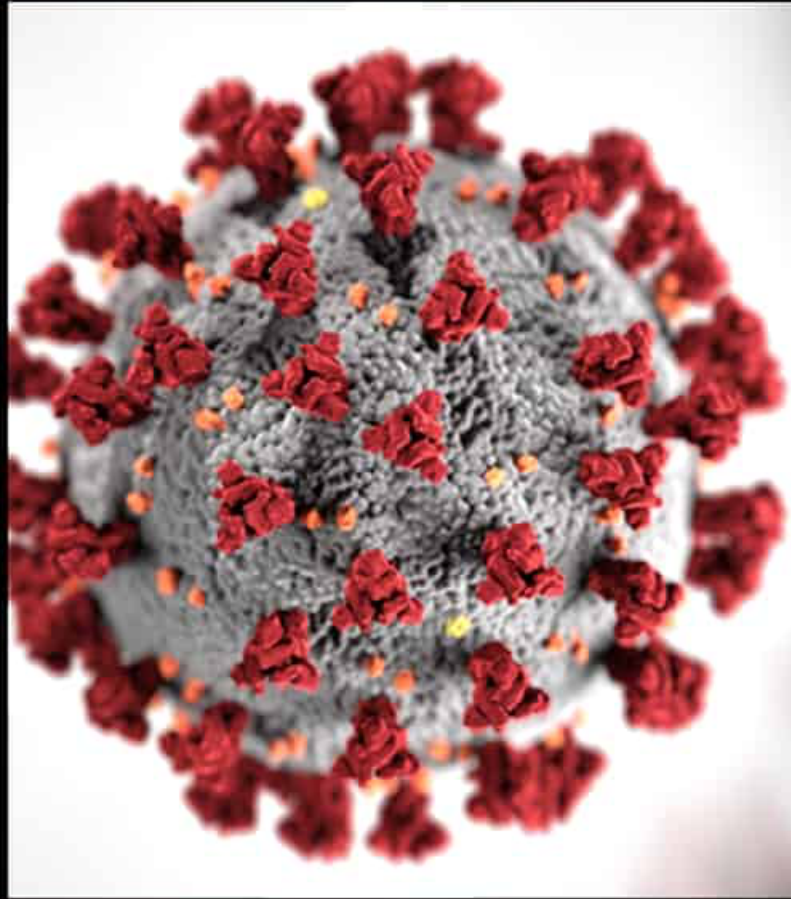


# Role of Ascorbic Acid in Covid 19 Management



**Dr Yuen Chuen Fong Raymond**  
MBBS, MMed, MMedSc, FAMS

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T: 67461772  
E: drhosanna@gmail.com



# COVID-19

CORONAVIRUS DISEASE 2019

# Booster Immune System

- Sleep
- Rest
- Reduce stress
- Sun Exposure
- Avoid Immune suppressing drugs/alcohol
- Improve air quality
- Gut health
- Immune booster food
- No sugar

# Nutritional Supplements

- Buffered C Powder ( Sodium Ascorbate)
- anti-pathogenic microbe (antiviral, antibacterial, antifungal and antiprotozoal)

Vitamin D3: immune protocol 150k IU per day for 3 days followed by 5k IU daily maintenance dose.



# Nutritional Supplements

- Vitamin A – activate and recruit WBC, regeneration of epithelial cells (skin, GIT, UT, Lung.) epithelial barrier
- 25 K IU/ day for 2 weeks
- Vitamin B
- Magnesium
- Zinc

# Nutritional Supplements

- N Acety Cysteine
- Glutathione
- L Lysine
- Omega 3
- Pre/Probiotics
- Antiviral Herbs : Elderberry, Echinacea, Olive Leave Extract, Licorice root, cat' claw, calendula, golden seal, propolis, oregano oil, clove oil.

# Treatment ?

- Quarantined
- Supportive : Oxygen therapy
- Anti viral. Remdesivir, Favilavir
- Anti HIV. Lopinavir , ritonavir
- Anti Malaria. Chloroquine
  
- Vaccines

# Nutraceutical (functional / Medicinal foods)

- High doses of Anti-oxidants
- Ascorbic Acid ( Vitamin C )
- Glutathione
- Alpha Lipoic Acid
  
- Reduce inflammation
- Suppress reproduction and spread of the virus
- Booster immune function

# Nutraceuticals have potential for boosting the type 1 interferon response to RNA viruses including influenza and coronavirus

Mark F. McCarty <sup>a</sup>, James J. DiNicolantonio <sup>b</sup>  

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<https://doi.org/10.1016/j.pcad.2020.02.007>

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## NOX2-dependent oxidant production inhibits TLR7 signaling

In light of worldwide concern regarding the recent outbreak of a deadly novel strain of coronavirus in China, it is fortuitous that two recent discoveries point the way to effective nutraceutical measures for potentiating the type 1 interferon response to RNA viruses.

Table 1. Provisional daily dosage suggestions for nutraceuticals that might aid control of RNA viruses including influenza and coronavirus

---

Ferulic acid	500-1,000 mg
Lipoic acid	1,200-1,800 mg (in place of ferulic acid)
Spirulina	15 g (or 100 mg PCB)
N-Acetylcysteine	1,200–1,800 mg
Selenium	50-100 mcg
Glucosamine	3,000 mg or more
Zinc	30-50 mg
Yeast Beta-Glucan	250-500 mg
Elderberry	600–1,500 mg

---



# non-pharmaceutical measures

- “This rather unique and unprecedented public health response in China reversed the escalating cases in Hubei, where there has been widespread community transmission.”
- high doses of vitamin C,
- Three clinical trials are being conducted by scientists and institutions of higher learning in China, using placebos as a control. A clinical trial using mega doses of vitamin C as an interventional agent to treat a disease had never been carried out before, despite the countless literature mentioning its efficacy in several kinds of diseases, though the side effects are relatively unknown.

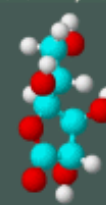




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March 22, 2020



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**FOR IMMEDIATE RELEASE**

**Orthomolecular Medicine News Service, Mar 21, 2020**

## **High-dose Intravenous Vitamin C Treatment for COVID-19**

**by Adnan Erol, M.D.**

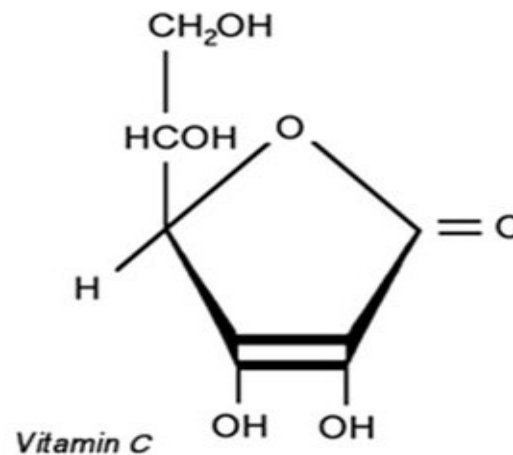
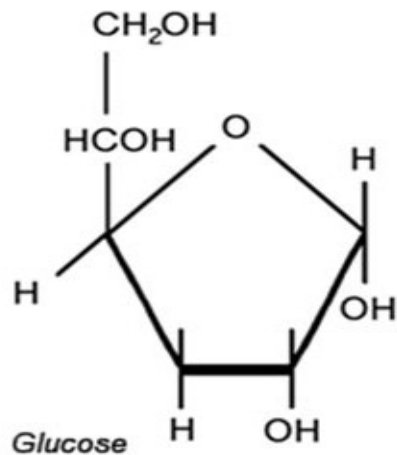
(OMNS Mar 21, 2020) The evidence about COVID-19 pneumonia and well-established knowledge about related conditions suggests it is caused by the hyperactivation of immune effector cells. High-dose vitamin C may suppress these immune system effectors. As intravenous high-dose vitamin C treatment is known to be safe, this suggests that intravenous high-dose vitamin C may be the treatment of choice in the early stages of COVID-19.

Coronaviruses (CoVs) are large, enveloped, and positive sense RNA viruses that infect a broad range of vertebrates and cause disease of medical and veterinary significance. Human respiratory corona viruses have been known since the 1960s to circulate worldwide and to cause respiratory infection with rather mild symptoms, suggesting that they are well-adapted to the human host. However, zoonotic coronaviruses, such as severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome coronavirus (MERS-CoV), can cause severe respiratory tract infection with high mortality [1].

In connection with the prooxidant role of vitamin C, which requires pharmacological (millimolar) rather than physiological (micromolar) concentrations, reevaluating the high-dose infusion of vitamin C would be a timely choice for the COVID-19-related ARDS. Altogether, patients diagnosed with COVID-19 and hospitalized with the breathing difficulty and abnormal biomarkers would seem to be excellent candidates for a short period of high dose intravenous vitamin C treatment in the early period of the disease. However, a concern that may arise with high-dose vitamin C treatment is osmotic cell death of immune cells, (but not apoptosis) which might generate a local inflammation in alveolar medium. Therefore, IV glucocorticoid treatment should be added to attenuate the possible inflammatory complications of high-dose vitamin C treatment. A previously experienced and comparably well-tolerated treatment regimen for high-dose intravenous vitamin C could be the administration of 50 mg/ per kilogram body weight every 6 hours for 4 days [\[16\]](#) with a glucose restriction. In addition, hydrocortisone 50 mg IV every 6 hours for 7 days should be added to fight against therapy-induced inflammation. Vitamin C when used as a parenteral agent in high doses may act pleiotropically as a prooxidant to attenuate pro-inflammatory mediator expression, improving alveolar fluid clearance, and to act as an antioxidant to improve epithelial cell functions.

# History

- Scurvy – 17<sup>th</sup> century sailor diseases.
- Vit C – isolated in 1928 and its structure was determined in 1933.







**James Lind, a surgeon in the Royal Navy, conducted clinical tests that proved that citrus fruits and their juices would cure and prevent scurvy, the disease which killed a million seamen between 1600 and 1800. In this painting he is shown aboard HMS *Salisbury* in 1747. Lind published his paper, *A Treatise on the Scurvy* was published in 1751. He later became Chief Surgeon of the Royal Naval Hospital and published many more papers on how to safeguard the health of sailors.**

Hosanna Clinic drhosanna@gmail.com

Image from *A History of Medicine in Pictures*, published by Parke, Davis & Co. in 1960; Artist: Robert A. Thom

## INACTIVATION OF POLIOMYELITIS VIRUS IN VITRO BY CRYSTALLINE VITAMIN C (ASCORBIC ACID)\*

By CLAUD W. JUNGBLUT, M.D.

(From the Department of Bacteriology, College of Physicians and Surgeons, Columbia University, New York)

(Received for publication, July 3, 1935)

Inactivation of the virus of poliomyelitis by various chemicals has formed the subject of investigation for many authors. The sum total of this work has demonstrated that this virus is peculiarly susceptible to the action of certain oxidizing agents (hydrogen peroxide, potassium permanganate, etc.), while at the same time exhibiting marked resistance against such general protoplasmic poisons as phenol.

Valuable as such studies are in that they aid in an understanding of the nature of the etiological agent, they are obviously of but little significance for the problem as to what chemical forces, if any, are engaged in the inactivation of the virus in the body of the normally insusceptible host or the recovered individual. An attempt to approach this question in a rational manner was made by studying the distribution of physiological poliocidal substances throughout the body. This led to the discovery that virus-neutralizing substances were present, not only in serum but in human tears (1), placenta (2) and pregnancy urine (3), as well as in adrenal extracts containing either the medullary (adrenalin) or the cortical (cortin) hormone (4). In the course of this work it was observed that the same endocrine secretions (adrenalin, cortin) (4) as well as certain antitoxic sera (5) were frequently capable of inactivating not only poliomyelitis virus but also diphtheria toxin. When it was furthermore found that an important constituent of the adrenal gland, *i.e.* vitamin C or ascorbic acid, possessed the power of inactivating diphtheria toxin *in vitro* and *in vivo* in extraordinarily small amounts (6), it became an im-

\* This work was carried out under a grant from the Rockefeller Foundation.



Jungeblut CW. **Inactivation of poliomyelitis virus** in vitro by crystalline **vitamin C** (ascorbic acid). J Exper Med, 1935. October; 62:517-521

Jungeblut CW. **Vitamin C therapy** and prophylaxis in experimental poliomyelitis. J Exp Med, 1937. 65: 127-146.

Jungeblut CW. Further observations on **vitamin C** therapy in experimental poliomyelitis. J Exper Med, 1937. 66: 459-477.

Jungeblut CW, Feiner RR. **Vitamin C** content of monkey tissues in experimental poliomyelitis. J Exper Med, 1937. 66: 479-491.

Jungeblut CW. A further contribution **to vitamin C therapy** in experimental poliomyelitis. J Exper Med, 1939. 70:315-332.



From:

[ncbi.nlm.nih.gov/pmc/articles/PMC1562195/pdf/canmedaj00527-0084.pdf](https://ncbi.nlm.nih.gov/pmc/articles/PMC1562195/pdf/canmedaj00527-0084.pdf)

**134 THE CANADIAN MEDICAL ASSOCIATION JOURNAL [Aug. 1937**

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**ASCORBIC ACID (VITAMIN C)  
TREATMENT OF WHOOPING COUGH\***

**BY M. J. ORMEROD, M.B. AND  
BYRON M. UNKAUF, M.D., B.Sc. (MED.)**

**DISCUSSION**

Ascorbic acid has a definite effect in shortening the period of paroxysms from a matter of weeks to a matter of days.

**CONCLUSIONS**

1. A method has been described for the treatment of whooping cough by ascorbic acid (vitamin C).
2. Ascorbic acid definitely shortens the paroxysmal stage of the disease, particularly if relatively large doses are used early in the disease.

**"The use of vitamin C in measles proved to be a medical curiosity. During an epidemic vitamin C was used prophylactically and all those who received as much as 1000 mg. every six hours, by vein or muscle, were protected from the virus."**

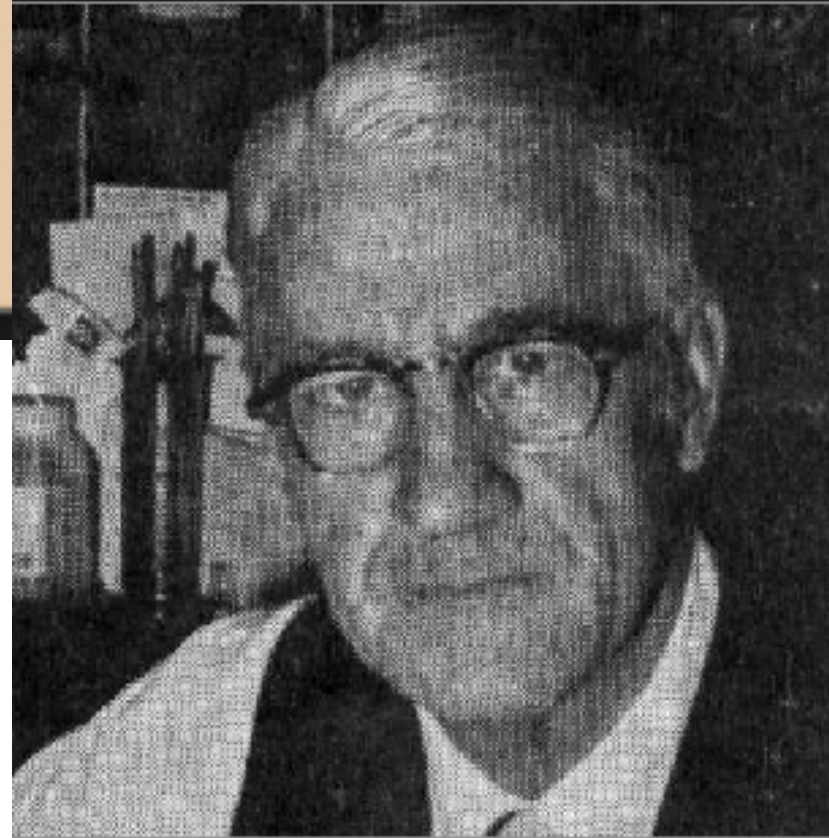
Frederick R. Klenner, M.D., F.C.C.P. (1949)

**"We were able to cure many cases of polio with massive doses of ascorbic acid."**

F. R. Klenner, M.D., F.C.C.P. (1949)



# VITAMIN C



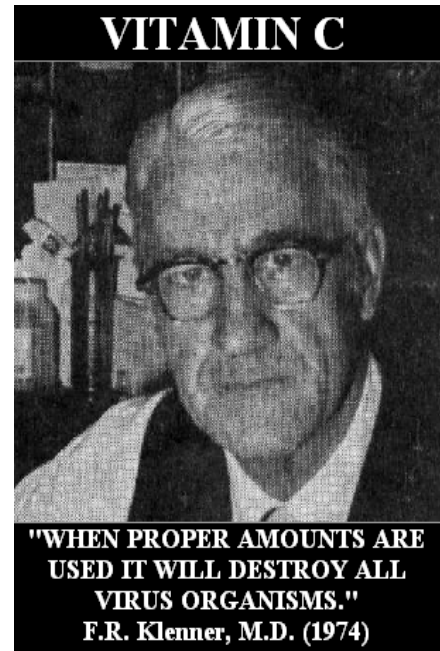
**"WHEN PROPER AMOUNTS ARE USED IT WILL DESTROY ALL VIRUS ORGANISMS."  
F.R. Klenner, M.D. (1974)**



The following is a list of the conditions that Dr. Klenner successfully treated with aggressive vitamin C therapy:

Pneumonia  
Encephalitis  
Herpes Zoster (shingles)  
Herpes Simplex  
Mononucleosis  
Pancreatitis  
Hepatitis  
Rocky Mountain Spotted Fever  
Bladder Infection  
Alcoholism  
Arthritis  
Some Cancers  
Leukemia  
Atherosclerosis

Ruptured Intervertebral Disc  
High Cholesterol  
Corneal Ulcer  
Diabetes  
Glaucoma  
Schizophrenia  
Burns and secondary infections  
Heat Stroke  
Radiation Burns  
Heavy Metal Poisoning (Mercury, Lead)  
Venomous Bites (insects, snakes)  
Multiple Sclerosis  
Chronic Fatigue  
Complications of Surgery



**“People in New Zealand have been treating whooping cough with Vitamin C for 30 years. I’ve started treating whooping cough in newborn babies and everyone, up to old age, with Vitamin C and have nothing but happy patients and parents.”**

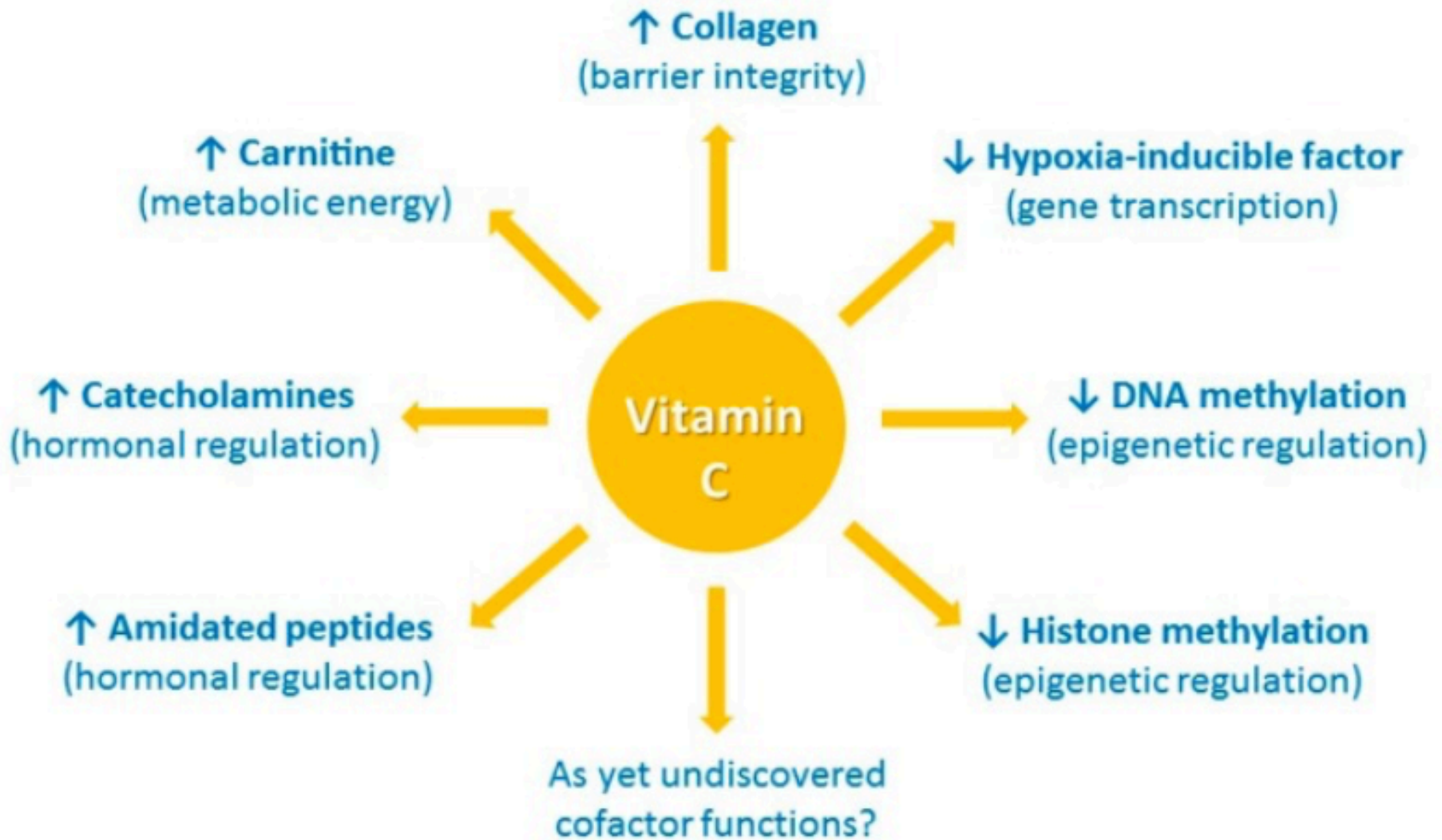


# High Dose Vitamin C saved a Patient with Swine Flu and Leukemia

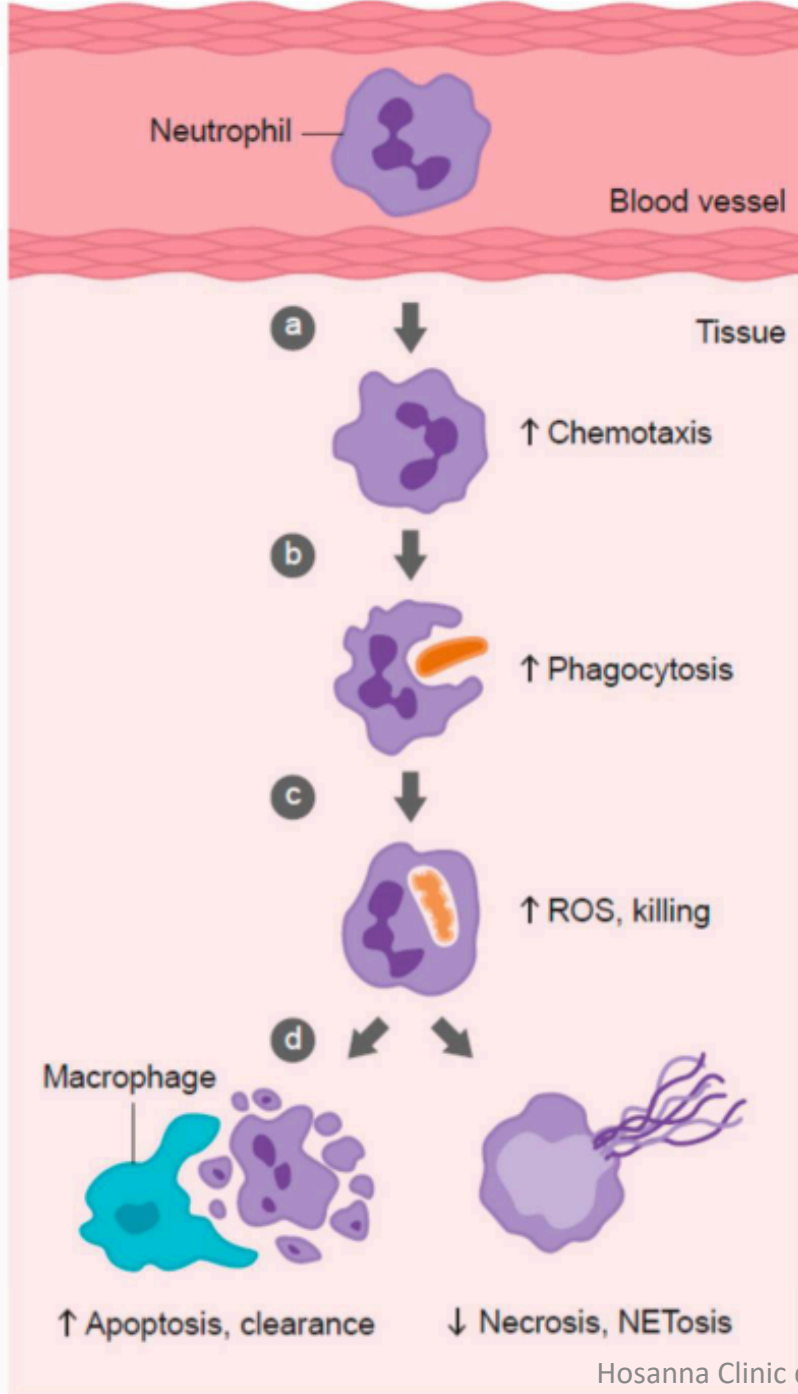


Family Meeting: Mr. Alan Smith, NP111111  
Date: Tuesday, 21 July 2009  
Present: Dr. S  
All of the Intensive Care Unit Medical Staff have  
are all in agreement that Vitamin C will be of no benefit.  
all agree that Mr. Smith will not survive. However, one  
we should wait a little longer before taking Mr. Smith off  
therefore reasonable to wait until Friday. If Mr Smith has  
, he will then be taken off ECMO.







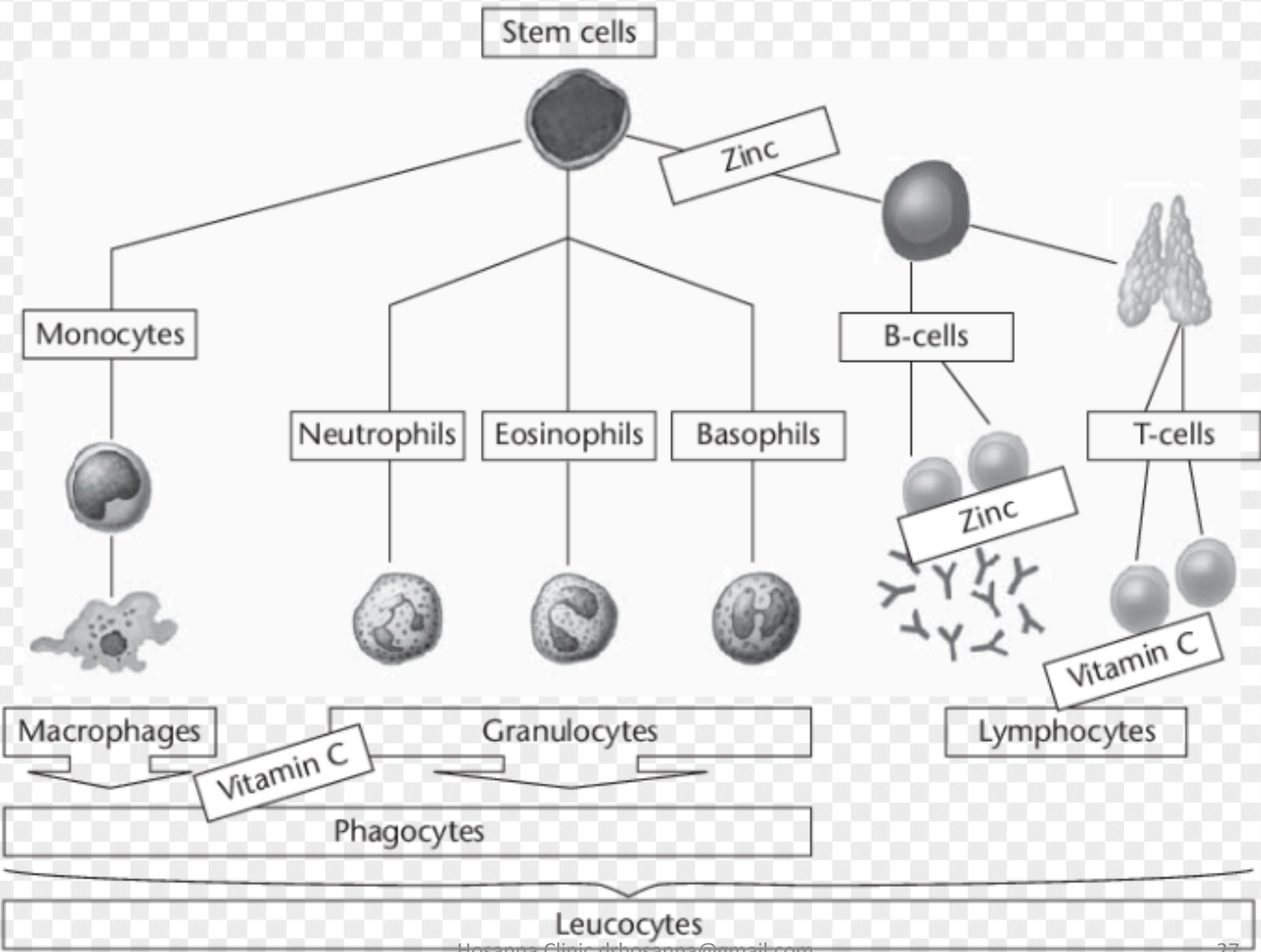


Vitamin C stimulates **neutrophil migration** to the site of infection, enhances **phagocytosis** and **oxidant generation**, and **microbial killing**.

it protects host tissue from excessive damage by enhancing **neutrophil apoptosis** and clearance by macrophages, and **decreasing neutrophil necrosis** and NETosis.

## Role of vitamin C in immune defense.

<b>Immune System</b>	<b>Function of Vitamin C</b>
	Enhances collagen synthesis and stabilization Protects against ROS-induced damage <sup>1</sup>
Epithelial barriers	Enhances keratinocyte differentiation and lipid synthesis Enhances fibroblast proliferation and migration Shortens time to wound healing in patients
Phagocytes (neutrophils, macrophages)	Acts as an antioxidant/electron donor Enhances motility/chemotaxis Enhances phagocytosis and ROS generation Enhances microbial killing Facilitates apoptosis and clearance Decreases necrosis/NETosis
B- and T-lymphocytes	Enhances differentiation and proliferation Enhances antibody levels
Inflammatory mediators	Modulates cytokine production Decreases histamine levels



"We were able to cure  
many cases of polio with  
massive doses of ascorbic  
acid."

F. R. Klenner, M.D., F.C.C.P. (1949)





# Vitamin C: The Pioneer

**Frederick R. Klenner, MD** [Oct. 22, 1907-May 20, 1984]

First doctor to fully realize what high-dose vitamin C could do, and proceeded to utilize it in that manner; published 28 papers documenting his results

Documented the ability of vitamin C to reliably *cure* many different acute infectious diseases and to reliably neutralize *any* toxin treated, when sufficiently dosed and administered for a long enough period of time

[http://www.seanet.com/~alexs/ascorbate/197x/klenner-fr-j\\_appl\\_nutr-1971-v23-n3&4-p61.htm](http://www.seanet.com/~alexs/ascorbate/197x/klenner-fr-j_appl_nutr-1971-v23-n3&4-p61.htm) [good Klenner review]

**"Modern Medicine thru the popular press, thru the scientific literature... they just lie. I'll give you the Truth. Vitamin C is an absolute Virucide. That means, in a test tube, if you have virus and you have vitamin C, the virus is dead... Vitamin C is the ultimate Antitoxin... Vitamin C exerts anticancer activity... High plasma vitamin C levels were clearly associated with a lower risk of coronary artery disease. Vitamin C has no known definable toxic dose."**



The following slides **what has vitamin C already been proven to do** was  
From Dr Thomas Levy slide presentation

# What Has Vitamin C Already Been Proven to Do?

1. Kill/inactivate all viruses *in vitro* against which it has been tested. Prominent examples:

A. Poliovirus: vitamin C completely inactivated the poliovirus, ***rendering it completely non-infectious***, even when injected directly into the brains of monkeys. Jungeblut, 1935 [19870431]

B. Herpesviruses:

Holden and Resnick (1936) The *in vitro* action of synthetic crystalline vitamin C on Herpes Virus  
*Journal of Immunology* 31:455-462

Holden and Molloy (1937) Vitamin C (ascorbic acid) on herpes virus.) Further experiments on the inactivation of herpes virus by vitamin C (*l*-ascorbic acid). *Journal of Immunology* 33:251-257

J Exp Med. 1935 Sep 30;62(4):517-21.

## **INACTIVATION OF POLIOMYELITIS VIRUS IN VITRO BY CRYSTALLINE VITAMIN C (ASCORBIC ACID).**

Jungeblut CW<sup>1</sup>.

 **Author information**

### **Abstract**

The experimental evidence presented in this paper shows that multiple paralytic doses of poliomyelitis virus, when mixed with very small amounts of crystalline vitamin C (ascorbic acid), are rendered non-infectious as determined by intracerebral injection of such mixtures into rhesus monkeys.

PMID: 19870431    PMCID: [PMC2133291](#)    DOI: [10.1084/jem.62.4.517](#)

**Free PMC Article**



## The *in Vitro* Action of Synthetic Crystalline Vitamin C (Ascorbic Acid) on Herpes Virus

Margaret Holden and Rose Resnick

J Immunol December 1, 1936, 31 (6) 455-462;

[Article](#)[Info & Metrics](#)[PDF](#)

### Summary

The experimental evidence presented in this paper shows that synthetic vitamin C (ascorbic acid) inactivates "W" virus *in vitro*. This is a non-specific action and is due to a pH effect since, when the vitamin is added to a virus suspension buffered between pH 5 to 8, it fails to inhibit the virus. The virus treated with unadjusted ascorbic acid loses its antigenic power.

These observations apply only to the inactivating effect of ascorbic acid on the virus in test tube mixtures and have no reference to the effect that vitamin C may exert in inhibiting virus infections in the animal body.

### In this issue

The Journal of Immunology

Vol. 31, Issue 6  
1 Dec 1936

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## Further Experiments on the Inactivation of Herpes Virus by Vitamin C (*I*-Ascorbic Acid)

Margaret Holden and Eleanora Molloy

J Immunol October 1, 1937, 33 (4) 251-257;

[Article](#)[Info & Metrics](#)[PDF](#)

### Summary

Synthetic vitamin C (ascorbic acid) at pH 6 inactivated *in vitro* minimal infective doses of "W" virus, when tested intracerebrally in rabbits.

Incubation of the mixtures of vitamin C and "W" virus was essential for the inactivation of the virus.

Treatment of 4 rabbits with 5 mgm. of synthetic ascorbic acid did not alter the course of dermal infection with "W" virus.

An excess of ascorbic acid was toxic, when injected intracerebrally in rabbits.

### In this issue

The Journal of Immunology

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# What Has Vitamin C Already Been Proven to Do?

1. Kill/inactivate all viruses *in vitro* against which it has been tested. Prominent examples:

**C. Vaccinia viruses:**

Kligler and Bernkopf (1937) Inactivation of vaccinia virus by ascorbic acid and glutathione. *Nature* 139:965-966

Turner G (1964) Inactivation of vaccinia virus by ascorbic acid. *J Gen Microbiol* 35:75-80 [14171261]

**D. Tobacco mosaic virus:**

Lojkin M (1936) A study of ascorbic acid as an inactivating agent of tobacco mosaic virus. *Contr Boyce Thompson Inst Pl Res* 8:455



Letter | Published: 05 June 1937

## Inactivation of Vaccinia Virus by Ascorbic Acid and Glutathione

I. J. KLIGLER & H. BERNKOPF

*Nature* **139**, 965–966(1937) | [Cite this article](#)

**13** Accesses | **6** Citations | **3** Altmetric | [Metrics](#)

### Abstract

JUNGEBLUT and his co-workers<sup>1</sup> have shown that the virus of poliomyelitis and diphtheria toxin were inactivated by ascorbic acid. One of us<sup>2</sup> has shown that addition of ascorbic acid to cultures of *C. diphtheri*" leads to production of relatively atoxic filtrates. Further studies on the nature of this interaction established a reasonable presumption that there was an oxidation-reduction between the ascorbic acid and toxophore group of diphtheria toxin.



## **Inactivation of Vaccinia Virus by Ascorbic Acid**

BY G. S. TURNER

*Virus Vaccine Department, Lister Institute of Preventive Medicine,  
Elstree, Hertfordshire*

(Received 1 October 1963)

### **SUMMARY**

Ascorbic acid undergoing auto-oxidation inactivated vaccinia virus. Copper ion was shown to have a catalytic effect on the inactivation. Neither unoxidized ascorbic acid nor its oxidation product, dehydroascorbic acid, were inhibitory. When ascorbic acid was oxidized at high pH in the absence of copper ion no inactivation took place. Similarly, enzymic oxidation of ascorbic acid in the absence of copper was without effect on the virus. Catalase prevented inactivation but not the oxidation of ascorbic acid. Glutathione prevented both inactivation and the oxidation of ascorbic acid. Inhibition experiments with ascorbic acid under anaerobic conditions were inconclusive. The mechanism of ascorbic acid inactivation is discussed in the light of these data and that of other authors with different viruses.

### **INTRODUCTION**

During experiments on the stability of vaccinia virus in the presence of various reducing agents, it was found that ascorbic acid was strongly inhibitory. Kligler & Bernkopf (1937) noted this phenomenon, and Jungeblut (1935) reported that ascorbic acid inactivated poliovirus. Similar results have been reported for herpes virus (Holden & Resnick, 1936; Holden & Molloy, 1937), bacteriophages (Lominski, 1936) and tobacco mosaic virus (Lojkin, 1936). Lojkin made a systematic study of the inhibitory effects of ascorbic acid on tobacco mosaic virus infectivity; our results with vaccinia virus are in many respects like hers.

# What Has Vitamin C Already Been Proven to Do?

1. Kill/inactivate all viruses *in vitro* against which it has been tested. Prominent examples:

**E. Bacteriophage viruses:**

Murata (1975) Mechanism of inactivation of bacteriophage deltaA containing single-stranded DNA by ascorbic acid. [1214179]

Morgan (1976) The mechanism of DNA strand breakage by vitamin C and superoxide and the protective roles of catalase and superoxide dismutase. [181730]

Richter (1982) Rapid inactivation of bacteriophage T7 by ascorbic acid is repairable. [7044421]

Samuni (1983) On the cytotoxicity of vitamin C and metal ions. A site-specific Fenton mechanism. [6317379]

## **Mechanism of inactivation of bacteriophage deltaA containing single-stranded DNA by ascorbic acid.**

Murata A, Oyadomari R, Ohashi T, Kitagawa K.

### **Abstract**

The mechanism of inactivation of a single-stranded DNA phage, deltaA of *Escherichia coli*, by AsA was investigated as a part of the study on the mechanism of inactivation of viruses by AsA. Bubbling air or oxygen gas through the reaction mixture, and the addition of oxidizing agents or transition metals into the reaction mixture enhanced the inactivation of the phage by AsA. In contrast, nitrogen gas bubbling, and the addition of reducing agents, chelating agents or radical scavengers prevented inactivation. The rate of inactivation was faster in the AsA solution preincubated for several minutes than in the freshly prepared AsA solution. DAsA, an oxidized form of AsA, demonstrated little effect on the activity of the phage. Concentrations of hydrogen peroxide which were theoretically produced by the autoxidation of AsA had no effect on the phage. The results indicated that the free radical intermediates produced during the course of the autoxidation of AsA participated in the inactivation. The radicals attacked the DNA of the phage to introduce strand scissions in the DNA, which might be mainly responsible for the inactivation.

Nucleic Acids Res. 1976 May;3(5):1139-49.

## **The mechanism of DNA strand breakage by vitamin C and superoxide and the protective roles of catalase and superoxide dismutase.**

Morgan AR, Cone RL, Elgert TM.

### **Abstract**

Vitamin C breaks DNA only in the presence of oxygen. Superoxide dismutase has no effect on the reaction but catalase suppresses it. Superoxide also gives rise to breaks in DNA suppressible by both superoxide dismutase and catalase. The hydroxyl radical seems to be the agent responsible for strand cleavage itself.

PMID: 181730    PMCID: [PMC342976](#)    DOI: [10.1093/nar/3.5.1139](#)

Biochim Biophys Acta. 1982 Apr 26;697(1):25-30.

## **Rapid inactivation of bacteriophage T7 by ascorbic acid is repairable.**

Richter HE, Loewen PC.

### **Abstract**

Treatment of bacteriophage T7 with ascorbic acid resulted in the rapid accumulation of single-strand breaks in the DNA with double-strand breaks appearing only after incubation times of 20 min or longer. The single-strand breaks were responsible for a rapid inactivation of the phage as assayed by immediate plating of the phage-bacteria mixture on nutrient agar. Incubation of the phage-bacteria mixture in liquid medium prior to plating allowed a host cell reactivation process to repair the nicks and reactivate the phage. Non-reversible inactivation of the phage was a slower process which could be correlated with the appearance of double-strand breaks in the phage DNA. Host cell reactivation of the phage was also manifested in the phenomena of delayed lysis and delayed appearance of the concatemeric DNA replication intermediate.

PMID: 7044421 DOI: [10.1016/0167-4781\(82\)90041-0](https://doi.org/10.1016/0167-4781(82)90041-0)

## **On the cytotoxicity of vitamin C and metal ions. A site-specific Fenton mechanism.**

Samuni A, Aronovitch J, Godinger D, Chevion M, Czapski G.

### **Abstract**

The toxicity of ascorbate towards phage lambda and the phages T2-T7 has been investigated. At room temperature the T-odd and lambda bacteriophages are highly susceptible to ascorbate-induced damage, whereas the T-even phages are practically resistant. The toxicity of ascorbate is dependent on the presence of copper (or iron) and oxygen, although oxygen is not required in the presence of H<sub>2</sub>O<sub>2</sub>. Hydrogen peroxide is essential for the ascorbate-induced phage inactivation and the damage is prevented by catalase. At the concentrations used, most of the copper ions are bound to the phage particles. Chelating agents such as EDTA or histidine fully protect the phages, whereas salicylate only reduces the rate of phage inactivation. OH scavengers such as sucrose, formate, mannitol, tert-butyl alcohol or poly(ethylene glycol) have no protective effect. Experiments with DNA labeled phages indicate that both phage adsorption and DNA injection are impaired as a result of the exposure to ascorbate and copper. The failure to express the viral genetic information as a result of single and double-strand breaks in the DNA, probably also contribute to the loss of the plaque-forming ability of the phages. The results are interpreted in terms of a 'site-specific' Fenton mechanism according to which the binding of the transition metal ions to the biological target is a prerequisite for the production of damage. The bound metal ion is reduced either by O<sub>2</sub>, ascorbate or other reductants and is subsequently reoxidized by H<sub>2</sub>O<sub>2</sub> yielding OH. radicals. This cyclic redox reaction of the metal generates OH. radicals which react with vital macromolecules with a high probability of causing 'multi-hit' damage. This 'site-specific' formation of OH. radicals, which takes place near the target molecules, accounts both for the high damaging efficiency and for the failure of OH. scavengers to protect against it.



# What Has Vitamin C Already Been Proven to Do?

1. Kill/inactivate all viruses *in vitro* against which it has been tested. Prominent examples:

**F. Enteroviruses:**

Salo (1978) Inactivation of enteroviruses by ascorbic acid and

sodium bisulfite. [29558]

**G. Influenza virus:**

Cheng (2012) [An *in vitro* study on the pharmacological ascorbate treatment of influenza virus]. [Article in Chinese] [22931805]

**H. Rabies virus:**

Amato G (1937) Azione dell'acido ascorbico sul virus fisso della rabia e sulla tossina tetanica. *Giornale di Batteriologia, Virologia et Immunologia* (Torino)

19:843-847; rabies virus inactivated *in vitro*



[Appl Environ Microbiol.](#) 1978 Jul; 36(1): 68–75. PMID: [PMC243036](#)

PMID: [29558](#)

## Inactivation of enteroviruses by ascorbic acid and sodium bisulfite.

[R J Salo](#) and [D O Cliver](#)

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This article has been [cited by](#) other articles in PMC.

### Abstract

Poliovirus type 1, coxsackievirus type A9, and echovirus type 7 were inactivated by sodium bisulfite and ascorbic acid. Inactivation rates depended upon concentration, temperature, and pH. RNA infectivity was lost during inactivation; the capsid was also altered by these inactivating agents, as determined by enzyme sensitivity assays and by tests of adsorption to cells. Structural modifications of the virus particles were not identical, suggesting that the mechanism of inactivation by ascorbic acid differs from that of sodium bisulfite.



## [An in vitro study on the pharmacological ascorbate treatment of influenza virus].

[Article in Chinese]

Cheng LL<sup>1</sup>, Liu YY, Li B, Li SY, Ran PX.

### + Author information

#### Abstract

**OBJECTIVE:** To investigate the effects and mechanism of pharmacological ascorbate against Influenza A/CA/7/09 (H1N12009).

**METHODS:** NHBE cells ( $\approx$  95% confluent monolayer) in 12-well plates (Corning) were kept at 37°C at all times. NHBE cells were exposed to A/CA/7/09 (H1N12009) influenza virus at MOI of 0.01 for 1 h, rinsed with NHBE medium, and incubated with NHBE medium containing 20 mmol/L ascorbate or 20 mmol/L ascorbate +600 IU/ml Catalase. The cells were then incubated for an additional 4 - 12 h and the culture medium was harvested for titration. Viral titers were determined as log(10) 50% tissue culture infective doses (TCID<sub>50</sub>) assay in MDCK cells. Ascorbate in NHBE medium was determined using HPLC separation coupled with coulometric electrochemical detection. Hydrogen peroxide was detected indirectly by Clark-type oxygen electrode.

**RESULTS:** In vitro experiments showed that pharmacological ascorbate killed not only isolated viruses, but also viruses from normal human bronchial epithelial cells. The antiviral effect of ascorbic acid appeared to be dose-dependent. 2.5 mmol/L ascorbic acid was able to eliminate 90% of the viruses and 20 mmol/L ascorbic acid totally blocked viral replication in vitro. The antiviral effect of pharmacological ascorbate varied at different phases of infection. Pharmacological ascorbate eliminated viral infectivity with treatment times as short as 4 hours at early stage of infection. But the effect was reversed by catalase.

**CONCLUSION:** Pharmacological ascorbate (vitamin C) as a pro-drug eliminates or kills influenza virus, probable by producing steady-state concentrations of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) in extracellular fluid.

## **In vitro inactivation of the rabies virus by ascorbic acid.**

Madhusudana SN<sup>1</sup>, Shamsundar R, Seetharaman S.

### **+ Author information**

#### **Abstract**

**OBJECTIVE:** The current recommended inactivating agent for the rabies virus, beta propiolactone (BPL) is very expensive and potentially carcinogenic. There is a need to evaluate alternative chemicals, which will inactivate the virus without affecting its antigenicity. In this study the effect of ascorbic acid on the infectivity of the rabies virus has been investigated.

**METHOD:** Vero cell grown fixed rabies virus CVS strain was treated with 0.1 mg/ml, 0.5 mg/ml and 1mg/ml final concentrations of ascorbic acid and 5 microg/ml of copper sulfate and kept at 4 degrees C along with untreated virus material. Each aliquot was titrated after various intervals for viral infectivity using both mice inoculation and titration in vero cells. The antigenicity of the virus material was determined by antibody induction in mice and modified NIH tests in parallel with virus material inactivated with a 1:4000 concentration of BPL.

**RESULTS:** An optimal concentration of 0.5 mg/ml of ascorbic acid and 5 microg/ml of copper sulfate completely inactivated the virus after 72 hours. The inactivated virus retained good antigenicity and potency value, which was comparable with using BPL.

**CONCLUSION:** These findings suggest that ascorbic acid can be used as an inactivating agent for fixed rabies virus grown in cell culture particularly for the preparation of diagnostic reagents. Further studies are required to evaluate its effect on the cell associated virus, probable therapeutic potential and feasibility of replacing BPL in production of inactivated rabies vaccine.

# What Has Vitamin C Already Been Proven to Do?

2. Resolve all *acute* viral syndromes for which it has been adequately dosed. Prominent examples:

A. Polio: Vitamin C cured acute polio (60 of 60 cases)  
(Klenner in 1949); full article:

[http://www.seanet.com/~alexs/ascorbate/194x/klenner-fr-southern\\_med\\_surg-1949-v111-n7-p209.htm](http://www.seanet.com/~alexs/ascorbate/194x/klenner-fr-southern_med_surg-1949-v111-n7-p209.htm)

Also, vitamin C cured acute but **advanced** polio and its associated *flaccid paralysis*:  
(Klenner in 1951); full article:

[http://www.seanet.com/~alexs/ascorbate/195x/klenner-fr-southern\\_med\\_surg-1951-v103-n4-p101.htm](http://www.seanet.com/~alexs/ascorbate/195x/klenner-fr-southern_med_surg-1951-v103-n4-p101.htm) )

South Med Surg. 1949 Jul;111(7):209-14.

## **The treatment of poliomyelitis and other virus diseases with vitamin C.**

KLENNER FR.

PMID: 18147027

Patricia A.D. Braun, M.D.  
Nutritional and Preventative Medicine - Chronic Illness Care

**KLENNER AND VITAMIN THERAPY** ©2012

**Dr. F. R. Klenner and Vitamin C Megadoses**

**HIDDEN IN PLAIN SIGHT: The Pioneering Work of FREDERICK ROBERT KLENNER, M.D.**

by Andrew W. Saul

Assistant Editor, Journal of Orthomolecular Medicine

Reprinted with permission from *J Orthomolecular Med*, 2007. Vol 22, No 1, p 31-38.

*"Some physicians would stand by and see their patient die rather than use ascorbic acid because in their finite minds it exists only as a vitamin."* F. R. Klenner, MD

The sound barrier was broken in 1947. The Korean War began in 1950. In between was the polio epidemic of 1948-9, during which Dr. Frederick Robert Klenner cured every polio case he saw by using vitamin C.

### **VITAMIN C AGAINST POLIO**

Claus W. Jungeblut (1) had the initial idea; William J. McCormick (2) was an early proponent of frequent gram-sized doses. But it was Frederick Robert Klenner who first gave polio patients tens of thousands of milligrams of vitamin C per day. He had been doing so since before D-Day, which was June 6, 1944.

"From 1943 through 1947," writes Robert Landwehr (3), "Dr. Klenner reported successful treatment of 41 more cases of viral pneumonia using massive doses of vitamin C. From these cases he learned what dosage and route of administration - intravenously, intramuscularly, or orally - was best for each patient. Dr. Klenner gave these details in a February 1948 paper published in the *Journal of Southern Medicine and Surgery* entitled '*Virus Pneumonia and Its Treatment with Vitamin C.*' (4) This article was the first of Dr. Klenner's twenty-eight (through 1974) scientific publications."

# Massive Doses of Vitamin C and the Virus Diseases

Fred R. Klenner, M.D., Reidsville, North Carolina

Presented in the Fifty-second Annual Meeting of the Tri-State Medical Association of the Carolinas and Virginia, held at Columbia, February 19th and 20th, 1951.

---

## (The Action of Vitamin C)

It has been reported that one of the mold-derived drugs, in addition to being a good antibiotic, is a super-vitamin. Conversely, we argue that vitamin C, besides being an essential vitamin, is a super-antibiotic. Vitamin C in vitro, if maintained at body temperature, inactivates certain toxins at an unbelievable rate. Five parts per thousand of vitamin C with toxins and appropriate controls, incubated at 37°C. for 48 hours showed when tested on mice the minimal lethal dose for the control tubes to be 1/16,000 c.c., while that from the mixture of vitamin C and toxin was only 1/1,000 of a c.c. (Klegler, Guggenheim; Warburg, 1938). In this study the loss of vitamin C in toxin broth and ordinary broth controls followed a constant pattern; the loss, however, was always greater in the toxin broth tube. The difference between the rate of disappearance of vitamin C in toxin and ordinary broth was more striking the greater the concentration of vitamin C. It is, therefore, reasonable to conclude that the degree of neutralization in a virus infection will be in proportion to the concentration of the vitamin and the length of time in which it is employed.

Since it has long been known that the virus organism resembles more the toxins and ferments than the common animate causes of disease, it would seem plausible that the detoxication effected by vitamin C is produced by a direct combination of the vitamin with the toxin and/or virus, this followed by the oxidation of the new compound which destroys both the virus and/or toxin and the vitamin. This destruction of the virus by oxidation has been concurred in by many investigators. Since vitamin C is an integral part of the oxidation-reduction system of the body, its function in the role of an antibiotic becomes intelligible. To appreciate the antagonistic properties of vitamin C against the virus organism and the chemical ferments of exotoxin-producing microorganisms, one must forget its present academic status as a factor essential for life. A cow is valuable to the farmer not only for her ability to produce milk, but also as a source of organic fertilizer. Vitamin C, likewise, is important, not only as a detoxifying agent, as a catalyst aiding cellular respiration by acting as a hydrogen transport, as a catalyst in the assimilation of iron, and as a conservator of collagen fibers and bundles in tissues of mesenchymal origin; but, also, because of its function as a reducing agent or the precursor of such a substance. In this latter capacity it fulfills the requirements of an antibiotic. A striking phenomenon of vitamin C is the similarity of response, whether to correct pathologic processes due to a deficiency of this compound, acting as a vitamin; or to destroy the ferments of microorganisms, acting as an antibiotic.

Within a few hours after institution of adequate vitamin C therapy to correct an avitaminosis, histological evidence of bone improvement is obtainable. Fibroblasts begin to form normal connective tissue and capillary buds are invading hemorrhagic areas (Youmans, 1941). Similar is its dramatic antibiotic action, the rule being clear evidence of clinical response within a few hours.

The purpose of this paper is to present clinical proof of such action for this vitamin.

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# What Has Vitamin C Already Been Proven to Do?

2. Resolve all *acute* viral syndromes for which it has been adequately dosed. Prominent examples:

Years after Klenner's experience with polio, it was demonstrated that polio responded very well to high-dose vitamin C given *orally* as well, with 5 patients receiving between 50,000 and 80,000 mg given at various times over a 10-day treatment period. Greer, 1955 [13279345]

Another clinician showed much lower doses of vitamin C clearly accelerated the resolution time of polio patients, including normalizing elevated temperatures. Baur, 1952 [13021801]

# What Has Vitamin C Already Been Proven to Do?

2. Resolve all *acute* viral syndromes for which it has been adequately dosed. Prominent examples:

Acute hepatitis:

Dalton, 1962 [13883259] (Six daily 2,000 mg injections)

Cathcart, 1981 [7321921] (Reported that he never had a single case of acute viral hepatitis fail to respond to properly dosed IVC, and that he never had a VC-treated hepatitis patient subsequently develop chronic hepatitis)

Orens, 1983 [6573223] (IV and oral)

# What Has Vitamin C Already Been Proven to Do?

2. Resolve all *acute* viral syndromes for which it has been adequately dosed.

Dr. Klenner's approach to acute hepatitis:

Initial Rx was 500 to 700 mg of VC/kg body weight by vein, given every 8 to 12 hours. As well, a minimum of 10,000 mg VC orally every day. Routinely, resolution was seen in 2 to 4 days.

Klenner also resolved acute hepatitis with 5,000 mg of VC every four hours or so orally. Complete resolution was achieved in 4 days, utilizing a total of about 120,000 mg given.

(1974) Klenner F. Significance of high daily intake of ascorbic acid in preventive medicine.

*Journal of the International Academy of Preventive Medicine* 1:45-69

# What Has Vitamin C Already Been Proven to Do?

2. Resolve all *acute* viral syndromes for which it has been adequately dosed. Prominent examples:

Vitamin C repeatedly cured cases of viral encephalitis, many *presenting in coma*:

(July 1949) Klenner F. The treatment of poliomyelitis and other virus diseases with vitamin C. *Southern Medicine & Surgery* 111:209-214 [18147027]

(April 1951) Klenner F. Massive doses of vitamin C and the virus diseases. *Southern Medicine & Surgery* 103:101-107 [14855098]

(1953) Klenner F. The use of vitamin C as an antibiotic. *Journal of Applied Nutrition* 6:274-278

(1971) Klenner F. Observations of the dose and administration of ascorbic acid when employed beyond the range of a vitamin in human pathology. *Journal of Applied Nutrition* 23:61-88

# What Has Vitamin C Already Been Proven to Do?

2. Resolve all *acute* viral syndromes for which it has been adequately dosed.

Prominent examples:

Comatose New Zealand farmer with H1N1 “swine flu” directly prior to having life support discontinued (2010). See:

<http://peakenergy.com/video.php>

# What Has Vitamin C Already Been Proven to Do?

2. Resolve all *acute* viral syndromes for which it has been adequately dosed. Prominent examples:

A. Measles (simple and complicated)

B. Mumps (simple and complicated); Klenner, 1949  
[18147027]

C. Herpes infections, *acute* (chickenpox) Dainow, 1943 68 197;  
Zureick, 1950 [14908970]; (1974) Klenner 1 45

D. Rabies: vitamin C-treated guinea pigs had improved survival  
Banic, 1975 [1191395]; No studies of humans infected with  
rabies and treated with VC found



# Vitamin C and Safety

Vitamin C has *no known toxic dosage* in patients without preexisting kidney disease.

“...194,054 g, or 427 lbs of IV vitamin C” were “administered to 275 patients with no sign of kidney disease, or any other significant side effects over a 16- year period.”

(2002) Jackson et al. Full article available at:

[http://www.riordanclinic.org/research/articles/89023765\\_jom.pdf](http://www.riordanclinic.org/research/articles/89023765_jom.pdf)

# Vitamin C and Safety

In a Harvard study on 85,557 women with no history of kidney stones, vitamin C intake was not associated with risk of developing kidney stones. The Harvard researchers advised that “routine restriction of vitamin C to prevent stone formation appears unwarranted.”

[Curhan (1999), 10203369]

# Vitamin C and Safety

Another large study, the Harvard Prospective Health Professional Follow-Up Study:

“The intake of high doses of vitamin C does not increase the risk of calcium oxalate kidney stones...”

The members of the group with the *highest* vitamin C intake “had a lower risk of kidney stones” than those with the *lowest* intake.

[Gerster (1997), 9429689]

# Vitamin C and Safety

Continuous vitamin C infusions of 50 grams daily were given over an eight-week period in terminal cancer patients with no definable negative side effects.

[Casciari (2001), 11384106]

Full article available

# Vitamin C and Safety

Serum vitamin C levels were examined in relation to the history of kidney stones in over 10,000 subjects, and *no* evidence was found to indicate that high vitamin C levels increased the prevalence of kidney stones. Conversely, the *higher* the vitamin C levels in the blood, the *lower* the incidence of kidney stones.

[Simon (1999), 10090119]

# Vitamin C and Safety

Over 55 other factors, in addition to vitamin C, can raise urinary oxalate levels and increase the risk of stone formation, *in patients with preexisting kidney disease*. In pregnancy, for example, the urine becomes *as supersaturated* with calcium oxalate as in patients with established stone disease, but there is *no* increased risk of stones associated with pregnancy. Elevated urine oxalate is a risk factor for stone disease *in patients with preexisting kidney disease only*.

[Maikranz (1989), 2811052]



# Vitamin C and Safety

Even though it is not used in most hospitals currently, high dose intravenous vitamin C is used widely around the world now in doctors' clinics and offices, with no definable evidence of harm in patients without preexisting kidney disease

[Padayatty (2010), 20628650] Full article available

# Vitamin C and Safety

A person with normal kidney function can successfully kill himself with excess water ingestion. There is no established dosage at or beyond which such a person can reliably kill himself with vitamin C. Is water more toxic than vitamin C?

[Hayashi (2005), 15914312]



# DOES HIGH DOSE INTRAVENOUS VITAMIN C CAUSE KIDNEY STONES OR KIDNEY FAILURES?

- It has been documented that oral ingestion of oral vitamin c was associated with a dose dependent 2 fold increased risk of kidney stones formation among men .(1)
- The anecdote of vitamin C and kidney stones is mentioned in a major textbook of pharmacology: “...risks of megadose treatment ... include formation of kidney stones” (Marcus & Coulston 2001). The statement that vitamin C may cause kidney stones has been reiterated, e.g., in the Nordic Nutritional Recommendations without any references (NNR 2004 p 310).”
- Vitamin C does increase the production of oxalate in the body, there is no evidence that it increases stone formation. It could even have the reverse effect, for several reasons.
- Firstly, vitamin C tends to bind calcium, which could decrease its availability for formation of calcium oxalate.
- Secondly, vitamin C has a diuretic action: it increases urine flow, providing an environment that is less suitable for formation of kidney stones.
-

# DOES HIGH DOSE INTRAVENOUS VITAMIN C CAUSE KIDNEY STONES OR KIDNEY FAILURES?

- Finally, stone formation appears to occur around a nucleus of infection. High concentrations of vitamin C are bactericidal and might prevent stone formation by removing the bacteria around which stones form.
- Vitamin C could also prevent other types of kidney stones. Less common forms of stone include uric acid stones (8%), that form in gout, and cystine stones (1%), which can occasionally be formed in children with a hereditary condition; these stones are not side effects of vitamin C. Other stones include those made from calcium phosphate (5%), which dissolve in a vitamin C solution. Acid urine, produced by ascorbate, will also dissolve the struvite stones (magnesium ammonium phosphate) that often occur in infected urine.
- Ascorbate in low or high doses generally does not cause significant increase in urinary oxalate.[6-10]
- Ascorbate tends to **prevent** formation of calcium oxalate kidney stones.[7,8]
- Risk factors for kidney stones include a history of hypertension, obesity, chronic dehydration, poor diet, and a low dietary intake of magnesium.

## References:

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# Vitamin C, Legal Considerations

## Do you have the right to health care?

Most would say yes, in both the medical and legal arenas, but you do *not* have the unbridled right to health care with the following considerations:

1. Extraordinary expense (e.g., transplant)
2. Experimental and/or unproven nature
3. Substantial risk of severe side effects



# Vitamin C, Legal Considerations

Conversely, as a patient, you **DO** have the right to any therapy that is:

1. Not prohibitively expensive (or even cheap)
2. Established to be effective
3. Not prohibitively toxic, or suspected to be (or with no defined toxicity)

# Vitamin C, Legal Considerations

Vitamin C is:

1. Remarkably inexpensive
2. Repeatedly established to be effective for 70+ years now in the medical literature and in medical clinics for multiple decades
3. Quite possibly the *least* toxic supplement or drug to ever be administered to patients without preexisting kidney disease

# Vitamin C: Practical Considerations

Regardless of whether there exists an appropriate antibiotic or other antimicrobial agent for administration, vitamin C should *always* be part of *any* protocol for *any* infection, acute or chronic, because:

1. Vitamin C significantly enhances immune function, in at least 20 different ways. (2002) Levy, *Curing the Incurable*, pp. 180-3
2. Vitamin C has its own direct anti-pathogen properties (iron, Fenton reaction)
3. Vitamin C neutralizes specific endotoxins, exotoxins, and the nonspecific pro-oxidant effects associated with any infection
4. All infections consume vitamin C, so failing to supplement with vitamin C means the patient will be dealing with infection-induced pre-scurvy and even frank scurvy as well (consider making *serial* plasma vitamin C levels a routine part of the testing in all hospitalized patients)

“Any physician, or panel of hospital-based physicians, claiming that vitamin C is experimental, unapproved, and/or posing unwarranted risks to the health of the patient, is really only demonstrating a complete and total ignorance or denial of the scientific literature. A serious question as to what the real motivations might be in the withholding of such a therapy then arises..... ignorance of medical fact is ultimately no sound defence for a doctor withholding valid treatment, especially when that information can be easily accessed.”

~ Dr Thomas Levy M.D., J.D.

J Crit Care. 2018 Oct;47:211-218. doi: 10.1016/j.jcrc.2018.07.004. Epub 2018 Jul 5.

## Combined vitamin C, hydrocortisone, and thiamine therapy for patients with severe pneumonia who were admitted to the intensive care unit: Propensity score-based analysis of a before-after cohort study.

Kim WY<sup>1</sup>, Jo EJ<sup>2</sup>, Eom JS<sup>3</sup>, Mok J<sup>4</sup>, Kim MH<sup>5</sup>, Kim KU<sup>6</sup>, Park HK<sup>7</sup>, Lee MK<sup>8</sup>, Lee K<sup>9</sup>.

### Author information

#### Abstract

**PURPOSE:** To evaluate the efficacy of combined vitamin C, hydrocortisone, and thiamine in patients with severe pneumonia.

**MATERIALS AND METHODS:** All consecutive patients with severe pneumonia who were treated with the vitamin C protocol (6g of vitamin C per day) in June 2017-January 2018 (n=53) were compared to all consecutive patients with severe pneumonia who were treated in June 2016-January 2017 (n=46). Propensity score analysis was used to adjust for potential baseline differences between the groups.

**RESULTS:** In the propensity-matched cohort (n=36/group), the treated patients had significantly less hospital mortality than the control group (17% vs. 39%; P=0.04). The vitamin C protocol associated independently with decreased mortality in propensity score-adjusted analysis (adjusted odds ratio=0.15, 95% confidence interval=0.04-0.56, P=0.005). Relative to the control group, the treatment group had a significantly higher median improvement in the radiologic score at day 7 compared with baseline (4 vs. 2; P=0.045). The vitamin C protocol did not increase the rates of acute kidney injury or superinfection.

**CONCLUSIONS:** Combined vitamin C, hydrocortisone, and thiamine therapy may benefit patients with severe pneumonia.

Combined vitamin C, hydrocortisone, and thiamine therapy for patients with severe pneumonia who were admitted to the intensive care unit: Propensity score-based analysis of a before-after cohort study

#### Highlights

- The vitamin C protocol was evaluated in patients with severe pneumonia.
- Hospital mortality tended to drop in the treatment group.
- The chest radiologic findings were significantly improved in the treatment group.
- This improvement associated independently with less hospital mortality.
- The treatment did not increase acute kidney injury or superinfection.



### Antioxidant

Radical oxygen scavenger protecting cells from oxidative stress

### Steroid- and catecholamine synthesis

Cofactor in catecholamine, vasopressin and steroid synthesis

Improves hemodynamics; may accelerate resolution of shock

### Immune cell function

Increases neutrophil phagocytosis and chemotaxis

Affects macrophage migration

Enhances T and NK cell proliferation, modulates their function

May increase antibody formation

### Endothelial cell function

[Click on image to zoom](#)

Decreases endothelial ICAM expression and leukocyte adhesion

Improves endothelial barrier function

Decreases fluid requirements in burn patients

Improves microcirculation

### Carnitine production

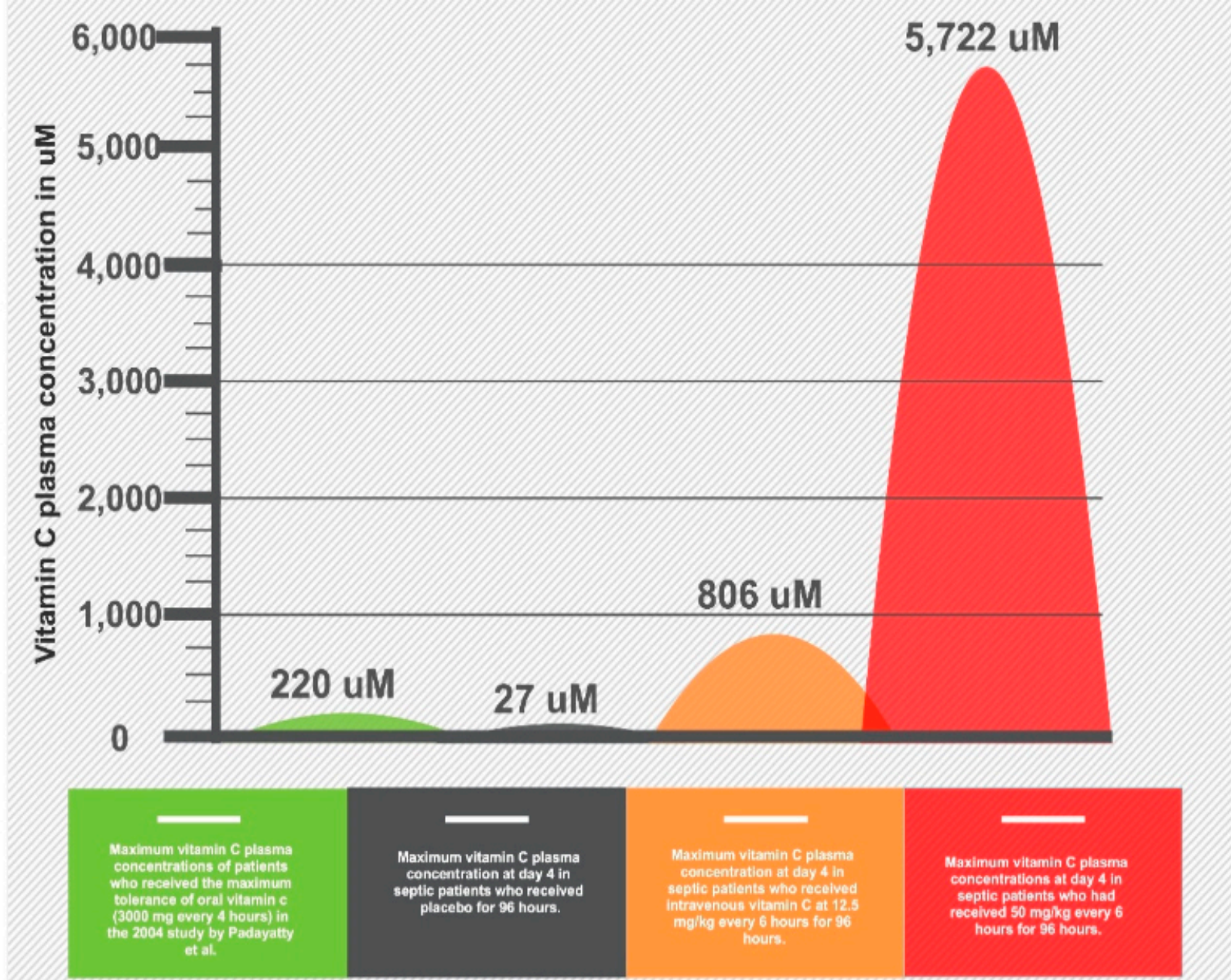
Modulates fatty acid metabolism

May improve microcirculation and cardiac function

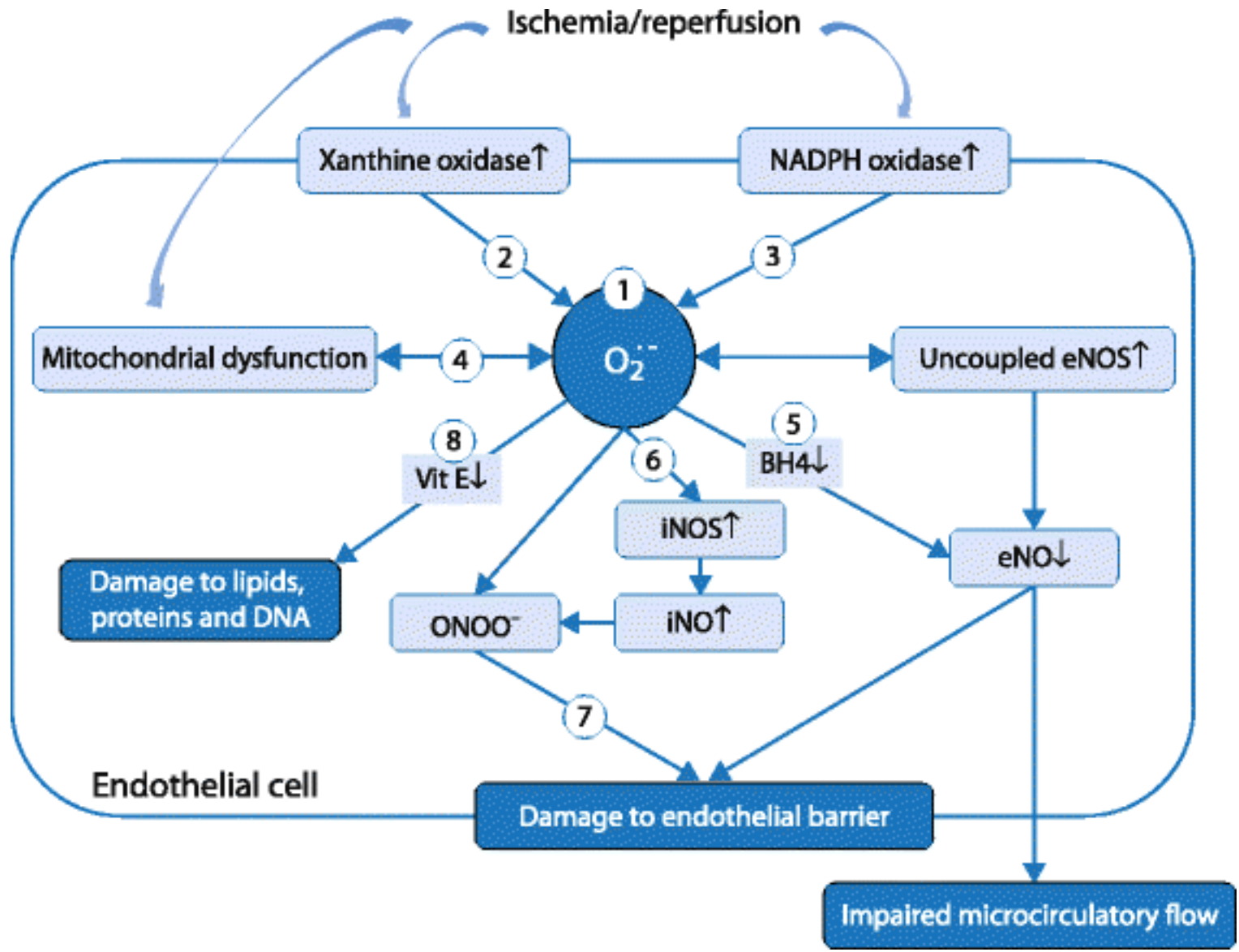
### Wound healing

Cofactor of collagen production

Mitogen for fibroblasts



**Figure 3.** Infographic of differential vitamin C peak plasma concentrations based on alternative routes of administration and dosage.



# Effect of vitamin C infusion on organ failure and biomarkers of inflammation and vascular injury in patients with sepsis and severe acute respiratory failure:

**Table.** Statistically Significant Secondary Outcomes

<b>Secondary Outcome</b>	<b>Placebo</b>	<b>Vitamin C</b>	<b>Mean Difference (95% CI)</b>
28-day all-cause mortality, %	46.3	29.8	16.58 (2 to 31.1)
ICU-free days to day 28	7.7	10.7	3.2 (0.3 to 5.9)
Hospital-free days to day 60	15.5	22.6	6.69 (0.3 to 13.8)

Fowler AA, Truwit JD, Hite RD, et al.

the CITRIS-ALI randomized clinical trial. JAMA. 2019;322:1261-1270.

# Effect of vitamin C infusion on organ failure and biomarkers of inflammation and vascular injury in patients with sepsis and severe acute respiratory failure:

In this trial, 167 patients with sepsis and ARDS at seven intensive care units in the United States received intravenous vitamin C or placebo every six hours **for 96 hours**. The authors report that compared with placebo, intravenous vitamin C **didn't result in improved** measures of **organ dysfunction** or levels of biomarkers indicating inflammation (**C-reactive protein**) or vascular injury (the **anticoagulant thrombomodulin**) by seven days.

**Limitations** of this preliminary study include that it may have been **underpowered** to detect differences in measures of organ failure and biomarker levels and the dosage of **vitamin C** **may have been insufficient**.



## Ascorbic acid role in containment of the world avian flu pandemic

- August 2007
- Experimental Biology and Medicine 232(7):847-51

clinical experience cited in all accounts, including the 2003 to 2006 period, suggest that:

- (i) ascorbic acid is not being administered to humans infected or at risk for influenza, and
- (ii) ascorbic acid is (mistakenly) believed to be a vitamin ("vitamin C").

Proper use of ascorbic acid as described here could provide effective containment for the flu pandemic.



**A novel scientific discovery shows, that vitamin C is not a vitamin. Namely Dr. John T. A. Ely published a study about the relationship between Ascorbic Acid (vitamin C) and bird flue. In this study he states, that Ascorbic Acid is (mistakenly) believed to be a vitamin.**

By definition vitamin is a substance which is necessary in small quantities for the body in order to maintain good health.

And this definition is not true in the case of 'vitamin' C.

A few animals, that make their own Ascorbic Acid (vitamin C):

- Cattle – Ascorbic Acid: 18 mg/kg/day  
(12,000 mg/day in total)  
+ dietary intake

- Cat – Ascorbic Acid: 20-40 mg/kg/day  
(180 mg/day in total)

- Goat – 185 mg/kg/day  
(13,000 mg/day in total)  
+ dietary intake

But when they stressed or ill, they can make up to 1,400 MG OF VITAMIN C PER KILOGRAM PER DAY! Goats hardly ever get sick. If they get sick, it's something so bad, that it kills them.

Let's presume, that our vitamin C requirement is not smaller than a guinea pig's daily needs. Let's count with 30 mg/kg/day just for the simplicity's sake. So if someone weighs 50 kg, then that person's daily dietary requirement is 1,500 mg.

So look at these values, as they represent the amounts of vegetables or fruits, what we should eat in order to satisfy our vitamin C requirements in this example. And please note these are values of FRESH fruits and vegetables, and not the ones that sit on the shelves for days and weeks. A person of 50 kg, who needs 1,500 mg of Ascorbic Acid, could satisfy his/her needs eating:

- Whole pepper: about 2 kg/day
- Lemon: about 4 kg/day
- Strawberry: about 4 kg/day
- Tomato: about 6 kg/day
- Sour Cherry: about 15 kg/day
- Cherry: about 19 kg/day
- Nectarine: about 22 kg/day
- Apple: 30 kg/day

Here is a citation from Dr. Albert Szent-Gyorgyi:

***“I strongly believe, that the correct application of Ascorbic Acid will fundamentally change our mortality statistics, including cancer too. This is why considering vitamin C a medicine – which is sold in ‘mg’ tablets by pharmacists – should be ceased. It should be kept in every household, and it should be found on the same shelves of grocery stores as sugar, salt and flour. The Ascorbic Acid powder should be sold by the pound. Ascorbic Acid is that kind of vitamin, that must be consumed as food.”***

## Ant Microbial Activity by. Dr Thomas Levy.

Enhancement of interferon production <sup>15-19</sup>  
Enhancement of phagocytic function <sup>20-38</sup>  
Selective concentration of vitamin C in  
white blood cells <sup>39-43</sup> Enhancement of cell-  
mediated immune response <sup>44</sup>  
Enhancement of cytokine production by  
white blood cells <sup>45</sup> Inhibition of T-  
lymphocyte apoptosis <sup>46</sup>  
Enhancement of nitric oxide production  
by phagocytes <sup>47</sup> Enhancement of T-  
lymphocyte proliferation <sup>48-50</sup> Enhancement  
of B-lymphocyte proliferation <sup>51</sup>

Inhibition of neuraminidase <sup>52</sup>  
Enhancement of antibody production and  
complement activity <sup>50 53-62</sup>  
Enhancement of natural killer cell activity <sup>63</sup>  
Enhancement of prostaglandin formation <sup>64-66</sup>  
Enhancement of cyclic GMP levels in  
lymphocytes <sup>67 68</sup>  
Enhanced localized generation of hydrogen  
peroxide <sup>69-71</sup>  
Vitamin C and hydrogen peroxide can dissolve  
the protective capsules of some bacteria, such as  
pneumococci <sup>72</sup>  
Detoxification of histamine <sup>73 74</sup>  
Neutralization of the oxidative stress that can  
otherwise enhance the infective process <sup>75</sup>  
Nonspecific immunopotential and  
improvement of the vaccination effect <sup>50 76 77</sup>  
Mucolytic effect of vitamin C <sup>78</sup>  
Possible alteration of bacteria cell surface  
qualities <sup>79</sup>

# Vitamin C:

## Evidence, application and commentary

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### ABSTRACT

Vitamin C is classically seen as a vitamin taken in small doses to prevent scurvy and support the immune system. However, there is increasing evidence showing that vitamin C has a much greater role to play in human health, particularly when supra-physiological doses are administered either orally or intravenously for patients with a wide range of conditions, including infections, cancer, cardiovascular diseases, wounds, diabetes and anaemia. Few incidences of severe adverse effects have been reported following vitamin C administration. The role of vitamin C in disease intervention at doses higher than previously considered relevant should be thoroughly investigated in a clinical setting.

### Keywords

Ascorbic acid; humans; antioxidants; factors, immunologic

(NZFP 2008; 35: 312–318)

### Introduction

Scurvy (first recorded by Hippocrates circa 400BC) has been a plague for centuries, especially during long-distance travel. James Lind was famous for recommending that the British Navy should give all sailors daily rations of citrus to prevent scurvy, but it was not until 1932 that Albert Szent-Györgyi recognised the vitamin C (ascorbic acid) in citrus as the cure for scurvy,<sup>1</sup> and that scurvy is the result of severe vitamin C deficiency.

Irwin Stone explained that humans lacked the enzyme, L gulonolactone oxidase, essential for producing vitamin C. He also proposed that while a small amount of vitamin C from foods was enough to prevent clinical scurvy, it was not enough to prevent sub-clinical scurvy which may be expressed as a wide range of diseases that improved with large doses of vitamin C.<sup>2</sup>

In the 1940s Frederick Klenner was giving 'megadoses' of vitamin C (in the form of sodium ascorbate) to patients with polio, diphtheria, herpes, chickenpox, influenza, measles, mumps, pneumonia, viral encephalitis and Shiga toxin poisoning. He used intravenous doses supplemented by additional oral



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# High Dose VC Protocol



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# Clinical Guide to the Use of Vitamin C

**The Clinical Experiences of Frederick R. Klenner, M.D.,  
abbreviated, summarized and annotated by Lendon H. Smith, M.D.  
2233 SW Market Street, Portland, Oregon 97201**

## How it Works

How does it work: as an oxidizing agent massive amounts, i.e., 5-150 grams, intravenously, for certain pathological conditions, if allowed to run in rapidly (20 gauge needle), acts as a “Flash Oxidizer” and may correct the condition in minutes. It can be a reducing agent. It neutralized toxins, viruses and histamine. The more serious the condition, the more C is required.

It appears that Vitamin C acts as a reducing agent, an oxidizing agent, an anti-clotting agent, an antihistamine, and as an anti-infective agent.

He summarized the function of C in poliomyelitis:

- 1.Virus destruction.
- 2.Dehydrates the brain and the spinal cord safely.
- 3.Supports and normalized the stressed adrenal glands.
- 4.It preserves the lining of the central canal and maintains more regular spacing and less crowding of
- 5.ependymal cells (surface cells of the spinal cord).

## **Dosage**

The amount of C depends upon the severity of the disease but also upon the efficiency of the victim's immune system. The usual dose of 65 mg per kilogram of body weight may be expected to take care of the usual virus infection when given every 2-4 hours by needle. The more severe condition would respond to larger single injections.

However "if the activity of the pathogen is completely stopped, the development of active immunity will be interrupted." Therefore, modification of childhood diseases is the aim of Vitamin C treatment, not the complete overnight suppression that would prevent the body from making immune memory. To accomplish modification, 250 mg per kilogram should be given intramuscularly. If necessary, half of this amount would be given in eight hours. Procaine 1.5-2% can be given with a separate syringe with the same needle just prior to the C.

The itch, the irritability, the pain, the vomiting of chicken pox measles and mumps was assuaged in one hour with this last dose. Crusting of chicken pox was present in 5 hours instead of 7-9 days. 250 mg per kilogram eliminated the disease in contrast to the 65 mg which just suppressed it. 350 mg per kilogram may be employed along with antibiotics in treating stubborn bacterial infections. Because a virus infection will deplete the Vitamin C reserve, bleeding from the nose or chest would indicate an emergency situation; Vitamin C, using the above noted dosage schedule, should be pumped in immediately.

## **Intravenous ascorbic acid protocol for cancer patients: scientific rationale, pharmacology, and clinical experience**

**Mikirova NA, Casciari JJ, Hunninghake RE, Riordan NH**

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Submission date: May 15, 2013; Acceptance date: August 23, 2013; Publication date: August 26, 2013

### **ABSTRACT:**

**Background:** Ascorbic acid (vitamin C, ascorbate) has been shown to protect cells against various types of oxidant injury at physiologically relevant concentrations. Vitamin C has been suggested as having both a preventative and therapeutic role in a number of pathologies when administered at much higher-than-recommended dietary allowance levels. This article reviews the scientific rationale for intravenous vitamin C as a potential treatment for cancer.

Many mechanisms of action for ascorbate efficacy against cancer have been proposed over the years. Cancer patients are often deficient in vitamin C, and require large doses to replenish depleted stores. It has been demonstrated *in vitro* and in animal studies that vitamin C is preferentially toxic to tumor cells at millimolar concentrations; moreover, pharmacokinetic data suggest that these concentrations are clinically achievable when ascorbate is administered intravenously. Data suggests that ascorbate may serve as a biological response modifier, affecting inflammation and angiogenesis as well as improving immune function parameters.

While Phase II clinical trials using ascorbate in cancer therapy are under way, vitamin C is not subject to the regulations that synthetic drugs are and therefore has been used clinically for decades to treat cancer patients. This clinical experience suggests the therapy is safe, and may be effective in some instances. Attached to this article is the Riordan IVC Protocol, which details an intravenous vitamin C protocol that can be safely administered to cancer patients.

## **CONCLUSIONS:**

Vitamin C can be safely administered by intravenous infusion at maximum doses of one-hundred grams or less, provided the precautions outlined in this report are taken. At these doses, peak plasma ascorbate concentrations can exceed 20 mM.

There are several potential benefits to giving IVC to cancer patients that make it an ideal adjunctive care choice:

- Cancer patients are often depleted of vitamin C, and IVC provides an efficient means of restoring tissue stores.
- IVC has been shown to improve quality of life in cancer patients by a variety of metrics.
- IVC reduces inflammation (as measured by C-reactive protein levels) and reduces the
- production of pro-inflammatory cytokines.
- At high concentrations, ascorbate is preferentially toxic to tumor cells and is an
- angiogenesis inhibitor.

**General Protocol**

General protocol in oncology patients who are undergoing treatment for newly diagnosed or relapsed cancer.

Eligibility for Therapy

Each of the criteria must be met in order for a patient to be considered eligible for high-dose intravenous ascorbic acid therapy.

Inclusion:

**1.1.1 G6PD status normal**

2.1.2 Patients must have histologically or cytologically diagnosed neoplasm

3.1.3 The patient must be screened for eligibility and have care approved by treating oncologist; the

4. oncology care is to be dictated by the oncology team and patient.

5.1.4 Patients must be of ambulatory status without evidence of spinal cord compression.

6.1.5 ECOG Performance Status 0-3.

7.1.6 Laboratory: ANC  $\geq$  1,500/mm<sup>3</sup>, Hemoglobin  $>$  8 g/dL, platelets  $\geq$  100,000/mm<sup>3</sup>, total bilirubin  $\leq$  1.5

8. mg/dL, creatinine  $\leq$  2.0 mg/dL, transaminase (AST/ALT)  $\leq$  2.5 X upper limit, urine uric acid  $<$  1,000

9. mg/d, urine pH  $<$  6, urine oxalate  $<$  60 mg/d.

10.1.7 Patients who have no language barrier, are cooperative, and can give informed consent before

11. entering the study after being informed of the medications and procedures to be used in this study to participate.

Exclusion:

8.1.8 Patients with evidence of a significant psychiatric disorder by history/examination that would prevent informed participation.

9.1.9 ECOG Performance Status of 4.

1.10 Co-morbid condition that would affect survival: end stage congestive heart failure, unstable angina, myocardial infarction within 6 weeks of study, uncontrolled blood sugars  $\geq 300$  mg/dL, patients with known chronic active hepatitis or cirrhosis.

1.11 Patients who consume an excess of alcohol or abuse drugs (an excess of alcohol is defined as more than four of any one of the following per day: 30mL distilled spirits, 340mL beer, or 120mL wine) will not be allowed.

**1.12**

**Patientswhosmoketobaccoproductswillnotbeallowedtoparticipate.**



## CLINICAL SCIENCES

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### Intravenous Ascorbic Acid: Protocol for its Application and Use

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High dose intravenous (IV) ascorbic acid (AA) has been used as therapy for infectious disease from bacterial and viral origin and adjuvant therapy for cancer. In this publication we describe a clinical protocol that has been developed over the past twenty years utilizing high dose

IVAA as therapy for cancer. This includes principles of treatment, rationale, baseline workup, infusion protocol, precautions and side effects.

*Key words: Intravenous ascorbic acid, Intravenous vitamin C, Cancer*

**H**igh dose intravenous ascorbic acid (IAA) has been used as a therapy for bacterial infection, viral infection, and as adjuvant therapy for Cancer (1-7). The treatment rationale for the use of IAA in treatment of cancer has been described in detail elsewhere (7-9). In general cancer patients have depressed circulatory, cellular and tissue ascorbate levels and reserves. Ascorbate administered in pharmacological doses enhances various parameters associated with better prognosis (7,8). There is also evidence that physiologically attainable concentrations by intravenous administration are selectively toxic to cancer cells (3-7,10); contrary to the limited levels of ascorbate that can be reached by oral intakes. Moreover, there is evidence of synergism between the conventional methods for cancer treatment (surgery, radiation and chemotherapy) when utilized with ascorbate (11-13).

pain and in many cases improved survival times beyond predictions of experienced oncologists. Later using 30 grams of IAA, twice per week, it was found that metastatic lesions in lung and liver of a man with primary renal cell carcinoma disappeared in a matter of weeks (3). At the time it was believed that IAA was helpful to cancer patients solely through two mechanisms; by increasing production and strengthening extra cellular collagen (in this manner preventing metastasis and further tumor growth) and by improving immune function (immune cell's activity and interferon). Subsequently, resolution of bone metastases in a patient with primary breast cancer was reported using infusions of 100 grams once or twice per week (4). Now it is known that other mechanism(s) exists by which ascorbic acid (AA) and its salts are capable of cytotoxic activity against malignant tissue. AA is preferentially toxic to tumor cells (5), this preferential toxicity has been detected in

**Table 1.** Osmolality of various amounts of sodium ascorbate/ascorbic acid in sterile water and Ringer's Lactate (mOsm; isotonic = 300 mOsm). Hypotonic mixtures are underlined; useful mixtures from isotonic to 1200 mOsm are in bold. An equal volume of IV solution is removed from the bag or bottle, prior to adding concentrated sodium ascorbate/ascorbic acid solution (500mg/mL).

Sodium ascorbate/ascorbic acid (gm.)	Final volume of sterile water'				Final volume of Ringer's lactate			
	250	500	750	1000	250	500	750	1000
1	39	19	13	10	336	318	312	309
15	579	290	193	145	843	572	481	436
30	1158	579	386	290	1386	843	662	572
60	2316	1158	772	579	2472	1386	1024	843
75	2895	1448	965	724	3015	1658	1205	979
100	3860	1930	1287	965	3920	2110	1507	1205

**Table 2. Final volume (cc)**

<b>Ascorbic acid (g)</b>	<b>Sterile water</b>	<b>Ringer's lactate</b>
1	250	250
15	250	250
30	500	500
60	750	750
75	750	1,000
100	1,000	1,250

-Remember to subtract AA quantity from bag or fluid.

The dose can be gradually increased over time but the infusion rate should not exceed 1gm AA per min., 0.5 gm/min is well tolerated by most patients. Although there is variability due to scheduling and tolerance, a typical protocol may consist of the following infusions:

week 1: 1 x 15gm.	infusion per day	2-3 per week
week 2: 1 x 30gm.	infusion per day	2-3 per week
week 3: 1 x 65gm.	infusion per day	2-3 per week
week 4: 1 x 100gm.	infusion per day	2-3 per week



## **The Riordan IVC Protocol for Adjunctive Cancer Care**

### **Intravenous Ascorbate as a Chemotherapeutic and Biological Response Modifying Agent**

#### **INTRODUCTION**

Vitamin C (ascorbate, ascorbic acid) is a major water-soluble antioxidant that also increases extracellular collagen production and is important for proper immune cell functioning (Hoffman, 1985; Cameron, et al., 1979). It also plays key roles in L-carnitine synthesis, cholesterol metabolism, cytochrome P-450 activity, and neurotransmitter synthesis (Geeraert, 2012). The Riordan intravenous vitamin C (IVC) protocol involves the slow infusion of vitamin C at doses on the order of 0.1 to 1.0 grams ascorbate per kilogram body mass (Riordan, et al., 2003). IVC use has increased recently among integrative and orthomolecular medicine practitioners: a survey of roughly 300 practitioners conducted between 2006 and 2008 indicated that roughly ten thousand patients received IVC, at an average dose of 0.5 g/kg, without significant ill effects (Padayatty, et al., 2010). While IVC may have a variety of possible applications, such as combating infections (Padayatty, et al., 2010), treating rheumatoid arthritis (Mikirova, et al., 2012), it has generated the most interest for its potential use in adjunctive cancer care.

## **The Riordan IVC Protocol for Adjunctive Cancer Care**

### **Intravenous Ascorbate as a Chemotherapeutic and Biological Response Modifying Agent**

assessed prior to the onset of therapy. The treatment is contra-indicated in situations where increased fluids, sodium, or chelating may cause serious problems. These situations include congestive heart failure, edema, ascites, chronic hemodialysis, unusual iron overload, and inadequate hydration or urine void volume (Rivers, 1987).

#### **THE RIORDAN IVC PROTOCOL**

##### Inclusion Criteria and Candidates

- 1) Candidates include those who have failed standard treatment regimens; those seeking to improve the effectiveness of their standard cancer therapy; those seeking to decrease the severity and carcinogenicity of side effects from standard cancer therapy; those attempting to prolong their remission with health-enhancing strategies; those declining standard treatment, yet wishing to pursue primary, alternative treatment.

- 3) Obtain baseline and screening laboratory:
  - a) Serum chemistry profile with electrolytes
  - b) Complete blood count (CBC) with differential
  - c) Red blood cell G6PD (must be normal)
  - d) Complete urinalysis
- 4) In order to properly assess the patient's response to IVC therapy, obtain complete patient record information prior to beginning IVC therapy:
  - a) Tumor type and staging, including operative reports, pathology reports, special procedure reports, and other staging information. (Re-staging may be necessary if relapse and symptom progression has occurred since diagnosis.)
  - b) Appropriate tumor markers, CT, MRI, PET scans, bone scans, and x-ray imaging.
  - c) Prior cancer treatments, the patient's response to each treatment type, including side effects.
  - d) The patient's functional status with an ECOG Performance Score.
  - e) Patient weight.

Ascorbate Mass(g) → <u>Vol†(cc)</u> (†500 mg/mL stock)	Recommended Dilution and <u>Osmolarity</u>	
	Dilute	<u>mOsm/L</u>
15 g → 30 cc	250 mL Ringers	909
25 g → 50 cc	500 mL Ringers	795
50 g → 100 cc	500 mL H <sub>2</sub> O	1097
75 g → 150 cc	750ml H <sub>2</sub> O	1088
100 g → 200 cc	1000 ml H <sub>2</sub> O	1085

*Table 1: Recommended Dilution and Osmolarity*



Treatment volume of Ascorbic acid	Solution Volume		Withdraw from solution and discard	remaining solution	Inject volume of AA into solution	inject volume of MgCl <sub>2</sub> into solution	final volume	Infusion rate	total infusion time
	Ringer Lactate	Sterile water							
15 grams (30cc)	250 cc		31cc	219 cc	30 cc	1 cc	250 cc	0.5-1.0 g/min	~ 0.5 h
25grams (50cc)	500cc		51cc	449cc	50cc	1cc	500cc	0.5-1.0 g/min	~ 1 h
50 grams (100cc)		500cc	102cc	398 cc	100 cc	2cc	500cc	0.5-1.0 g/min	~ 1.5 h
75 grams (150cc)		750cc	152cc	598cc	150cc	2cc	750cc	0.5-1.0 g/min	~ 2.5 h
100grams		1000cc	202cc	798cc	200cc	2cc	1000cc	0.5-1.0 g/min	~ 3.5 h

*Table 2: Treatment Volume of Ascorbic Acid*

FOR IMMEDIATE RELEASE

Orthomolecular Medicine News Service, May 11, 2015

## You Asked for It: More Nutrition Therapy Protocols, How-To Videos, Full-Text Papers

Here they are, all free access:

### **Cancer:**

The Riordan IVC Protocol for Adjunctive Cancer Care: Intravenous Ascorbate as a Chemotherapeutic and Biological Response Modifying Agent

<http://www.doctoryourself.com/RiordanIVC.pdf> or <https://riordanclinic.org/research-study/vitamin-c-research-ivc-protocol/>

Video by Ron Hunninghake, MD: ***The Riordan IVC Protocol***

<https://www.youtube.com/watch?v=04cOSwZ43II>

*Additional Riordan Clinic videos on IV treatment, cancer, nutrition:*

IVC & Cancer Symposium 2009:

<https://www.youtube.com/playlist?list=PL953B95B3BB977F54>

IVC & Cancer Symposium 2010:

<https://www.youtube.com/playlist?list=PL4CA531C7A3B0D954>

IVC & Cancer Symposium 2012:

[https://www.youtube.com/playlist?list=PLIQ39sMYH78sa\\_O6UR2OXVV-zbYvAS6VR](https://www.youtube.com/playlist?list=PLIQ39sMYH78sa_O6UR2OXVV-zbYvAS6VR)

IVC & Cancer Symposium 2014:


[https://www.youtube.com/playlist?list=PLIQ39sMYH78s2G\\_xweGZIUiDERrMet8ee](https://www.youtube.com/playlist?list=PLIQ39sMYH78s2G_xweGZIUiDERrMet8ee)

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## Vitamin C Infusion for the Treatment of Severe 2019-nCoV Infected Pneumonia

The safety and scientific validity of this study is the responsibility of the study sponsor and investigators. Listing a study does not mean it has  been evaluated by the U.S. Federal Government. [Know the risks and potential benefits](#) of clinical studies and talk to your health care provider before participating. Read our [disclaimer](#) for details.

### Sponsor:

ZhiYong Peng

### Information provided by (Responsible Party):

ZhiYong Peng, Zhongnan Hospital

Study Details

Tabular View

No Results Posted

Disclaimer

 How to Read a Study Rec

<p>Experimental: VC12g Vitamin C+sterile water for injection; total volume: 50ml. 12ml/h; infusion pump ; q12h.</p>	<p>Drug: VC12g Vitamin C will be infused in the experimental group twice a day for 7 days by the infusion pump with a speed of 12ml/h. Other Name: Vitamin C</p>
<p>Placebo Comparator: Sterile water for injection50ml water for injection. 12ml/h; infusion pump; q12h.</p>	<p>Drug: Sterile Water for Injection50ml sterile water for injection will be infused in the placebo comparator group twice a day for 7 days by the infusion pump with a speed of 12ml/h.</p>

## Outcome Measures

Go to

Primary Outcome Measures :

1. Ventilation-free days [ Time Frame: on the day 28 after enrollment ]  
days without ventilation support during 28 days after patients' enrollment

Secondary Outcome Measures :

1. 28-days mortality [ Time Frame: on the day 28 after enrollment ]  
whether the patient survives

2. ICU length of stay [ Time Frame: on the day 28 after enrollment ]  
days of the patients staying in the ICU

3. Demand for first aid measurements [ Time Frame: on the day 28 after enrollment ]  
the rate of CPR

4. Vasopressor days [ Time Frame: on the day 28 after enrollment ]  
days of using vasopressors

5. Respiratory indexes [ Time Frame: on the day 10 and 28 after enrollment ]  
P O<sub>2</sub>/F<sub>i</sub> O<sub>2</sub> which reflects patients' respiratory function

6. Ventilator parameters [ Time Frame: on the day 10 and 28 after enrollment ]  
Ecmo or ventilator

7. APACHE II scores [ Time Frame: on the day 10 after enrollment ]  
Acute Physiology and Chronic Health Evaluation

8. SOFA scores [ Time Frame: on the day 10 after enrollment ]  
Sepsis-related Organ Failure Assessment

*Does vitamin C damage DNA?*

No. If vitamin C harmed DNA, why do most animals make (not eat, but make) between 2,000 and 10,000 milligrams of vitamin C per human equivalent body weight per day? Evolution would never so favor anything that harms vital genetic material. White blood cells and male reproductive fluids contain unusually high quantities of ascorbate. Living, reproducing systems love vitamin C.

*Does vitamin C cause low blood sugar, B-12 deficiency, birth defects, or infertility?*

Vitamin C does not cause birth defects, nor infertility, nor miscarriage. "Harmful effects have been mistakenly attributed to vitamin C, including hypoglycemia, rebound scurvy, infertility, mutagenesis, and destruction of vitamin B-12. Health professionals should recognize that vitamin C does not produce these effects." (6)

*Does vitamin C . . .*

A randomized, double-blind, placebo-controlled 14 day trial of 3,000 mg per day of vitamin C reported greater frequency of sexual intercourse. The vitamin C group (but not the placebo group) also experienced a quantifiable decrease in depression. This is probably due to the fact that vitamin C "modulates catecholaminergic activity, decreases stress reactivity, approach anxiety and prolactin release, improves vascular function, and increases oxytocin release. These processes are relevant to sexual behavior and mood." (7)

**Megadose vitamin C therapy – Orthomolecular.org expounds on the therapy and its safety record.**

*Does vitamin C cause kidney stones?*

No. The myth of the vitamin C-caused kidney stone is rivaled in popularity only by the Loch Ness Monster. A factoid-crazy medical media often overlooks the fact that William J. McCormick, M.D., demonstrated that vitamin C actually prevents the formation of kidney stones. He did so in 1946, when he published a paper on the subject. (8) His work was confirmed by University of Alabama professor of medicine Emanuel Cheraskin, M.D.. Dr. Cheraskin showed that vitamin C inhibits the formation of oxalate stones. (9)

Other research reports that: "Even though a certain part of oxalate in the urine derives from metabolized ascorbic acid, the intake of high doses of vitamin C does not increase the risk of calcium oxalate kidney stones. . . (I)n the large- scale Harvard Prospective Health Professional Follow-Up Study, those groups in the highest quintile of vitamin C intake (greater than 1,500 mg/day) had a lower risk of kidney stones than the groups in the lowest quintiles." (10)

**Megadose vitamin C therapy – Orthomolecular.org expounds on the therapy and its safety record.**



Dr. Robert F. Cathcart said, "I started using vitamin C in massive doses in patients in 1969. By the time I read that ascorbate should cause kidney stones, I had clinical evidence that it did not cause kidney stones, so I continued prescribing massive doses to patients. Up to 2006, I estimate that I have put 25,000 patients on massive doses of vitamin C and none have developed kidney stones. Two patients who had dropped their doses to 500 mg a day developed calcium oxalate kidney stones. I raised their doses back up to the more massive doses and added magnesium and B-6 to their program and no more kidney stones. I think they developed the kidney stones because they were not taking enough vitamin C."

**Megadose vitamin C therapy – Orthomolecular.org expounds on the therapy and its safety record.**

*Why did Linus Pauling die from cancer if he took all that vitamin C?*

Linus Pauling, PhD, megadose vitamin C advocate, died in 1994 from prostate cancer. Mayo Clinic cancer researcher Charles G. Moertel, M.D., critic of Pauling and vitamin C, also died in 1994, and also from cancer (lymphoma). Dr. Moertel was 66 years old. Dr. Pauling was 93 years old. One needs to make up ones own mind as to whether this does or does not indicate benefit from vitamin C.

A review of the subject indicates that "Vitamin C deficiency is common in patients with advanced cancer . . . Patients with low plasma concentrations of vitamin C have a shorter survival." (11)

**Megadose vitamin C therapy – Orthomolecular.org expounds on the therapy and its safety record.**

*Does vitamin C narrow arteries or cause atherosclerosis?*

Abram Hoffer, M.D., has said: "I have used vitamin C in megadoses with my patients since 1952 and have not seen any cases of heart disease develop even after decades of use. Dr. Robert Cathcart with experience on over 25,000 patients since 1969 has seen no cases of heart disease developing in patients who did not have any when first seen. He added that the thickening of the vessel walls, if true, indicates that the thinning that occurs with age is reversed. . . The fact is that vitamin C decreases plaque formation according to many clinical studies. Some critics ignore the knowledge that thickened arterial walls in the absence of plaque formation indicate that the walls are becoming stronger and therefore less apt to rupture. . . Gokce, Keaney, Frei et al gave patients supplemental vitamin C daily for thirty days and measured blood flow through the arteries. Blood flow increased nearly fifty percent after the single dose and this was sustained after the monthly treatment. (12)."

**Megadose vitamin C therapy – Orthomolecular.org  
expounds on the therapy and its safety record.**

*What about blood pressure?*

A randomized, double-blind, placebo-controlled study showed that hypertensive patients taking supplemental vitamin C had lower blood pressure. (13)

*So why the flurry of anti-vitamin-C reporting in the mass media?*

Negative news gets attention. Negative news sells newspapers, and magazines, and pulls in lots of television viewers. Positive drug studies do get headlines, of course. Positive vitamin studies do not. Is this a conspiracy? You mean with unscrupulous people all sitting around a shaded table in a darkened back room? Of course not. It is nevertheless an enormous public health problem with enormous consequences.

150 million Americans take supplemental vitamin C every day. This is as much a political issue as a scientific issue. What would happen if everybody took vitamins? Perhaps doctors, hospital administrators and pharmaceutical salespeople would all be lining up for their unemployment checks.

**Megadose vitamin C therapy – Orthomolecular.org expounds on the therapy and its safety record.**

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# Hospital-based Intravenous Vitamin C Treatment for Coronavirus and Related Illnesses

by Andrew W. Saul and Atsuo Yanagisawa, MD, PhD

(OMNS February 2, 2020) No matter which hospital a coronavirus patient may seek help from, the question is, Will they be able to leave walking out the front door, or end up being wheeled out the basement backdoor? Prompt administration of intravenous vitamin C, in high doses, can make the difference.

Abundant clinical evidence confirms vitamin C's effectiveness when used in sufficient quantity. [\[1\]](#)

Physicians have demonstrated the powerful antiviral action of vitamin C for decades. [\[2\]](#)

## Specific instructions for intravenous vitamin C

The Japanese College of Intravenous Therapy (JCIT) recommends intravenous vitamin C (IVC) 12.5/25g (12,500 - 25,000 mg) for acute viral infections (influenza, herpes zoster, common cold, rubella, mumps, etc.) and virus mimetic infections (idiopathic sudden hearing loss, Bell's palsy). In adults, IVC 12.5g is given for early stage illness with mild symptoms, and IVC 25g for moderate to severe symptoms. IVC is usually administered once or twice a day for 2-5 continuous days, along with or without general treatments for viral infections.

### IVC 12.5g cocktail

Sterile water	125 mL
50% Vitamin C	25 mL (12.5g)
0.5M Magnesium sulfate	10 mL
Add Vitamin B complex	
Drip for 30-40 min	

### IVC 25g cocktail

Sterile water	250 mL
50% Vitamin C	50 mL (25g)
0.5M Magnesium sulfate	20 mL
Add Vitamin B complex	
Drip for 40-60 min	

# Protocol -High Dose AA for Covid19

- Patient Consent
- Complete blood pictures/CRP ESR
- G6PD screen
- Renal function/ liver function tests
- Urinalysis
- CXR
- ECG



# Protocol -High Dose AA for Covid19

- **Initial dose**
- AA 25 gm +
- B1 100mg, B6 100mg , B12 1000mcg +
- Calcium Gluconate 10% w/v +
- Magnesium Sulphate 10 ml in 150 ml of Hartman Solution
- Add hydrocortisone 50 mg q6h as necessary
- Run the drip in 30 -45 mins
- Follow by oral vitamin C 2 g every hourly till bowel tolerance or continuous iv 1 gm /hour

# Protocol -High Dose AA for Covid19

- Stepwise increase the dose of AA in every 10 g six hourly till 1 g/kg bodyweight is achieved.
- Once optimal AA dosage is reached, give iv 1g/kg C every 6-8 hourly .
- Monitor renal function and respiration , add hydrocortisone as necessary

# Protocol -High Dose AA for Covid19

- Maintenance dose
- Iv AA 1g/kg q 6-8 hourly
- B1, B6, B12 + daily
- Calcium Gluconate+ daily
- Magnesium + daily
- Hydrocortisone daily for 7 days.

# Protocol -High Dose AA for Covid19

- For mild and moderate patients,
- Suggest iv 1g/kg weight twice daily then follow by oral liposomal c 2 g hourly .
- oral NAC, vit D3 5000iu + Zinc + Selenium.
  
- For severe cases,
- 1v 1.5 g /kg C q6h plus glutathione , oral NAC, vit D3 5000iu + Zinc + Selenium.