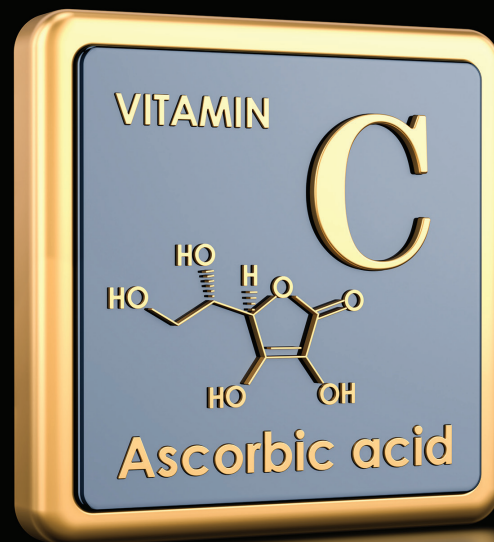


Call for practitioners to support campaign to get government to “Put the C in COVID”



Backed by a peer-reviewed paper in *Nutrients*, Institute for Optimum Nutrition founder Patrick Holford and a slew of scientists and international health organisations are calling on the UK government to acknowledge the accumulated evidence on vitamin C.

They say: “Vitamin C is a safe, inexpensive and highly effective anti-viral nutrient in the right amount, both for prevention of colds, reducing duration and severity, and for the treatment of COVID-19 in the acute phase with life-saving potential. Yet it is classified as ‘fake information’, not recommended by governments and rarely prescribed by doctors.

This has to change. Sign our petition: <https://www.vitaminc4covid.com>.”

“We all are calling for everyone in the natural health professions to support this campaign that has the potential to change the whole paradigm for natural medicine”, says Holford. “Prof Linus Pauling put the C in colds. We must put the C in COVID. As vital as vitamin D is, vitamin C is a life-saver. If used properly for prevention and treatment no-one needs to die from COVID-19”.

The campaign is sending copies of the *Nutrients* paper to NICE and SACN, plus all government agencies including SAGE members, Matt Hancock and all NHS chiefs.

With the paper go 7 demands:

- The government and its public health and nutrition agencies to thoroughly assess the evidence and fund studies of this inexpensive and safe nutrient.
- The government, NHS, health care and medical associations to recommend to all

citizens to supplement vitamin C during this viral epidemic, based on the available evidence.

- Content on “vitamin C for COVID-19 or corona” no longer being classified as false information in both digital, broadcast and print media.
- GPs, doctors and nutrition practitioners to be allowed and actively encouraged to recommend vitamin C supplementation for anyone with cold symptoms or coronavirus infection to reduce duration and severity of symptoms as an allowable health claim.
- All COVID-19 patients to be tested for vitamin C status and treated accordingly.
- Vitamin C to be given to all COVID-19 patients as early as possible on hospital admission.
- Intravenous vitamin C to be trialled as a standard adjunctive treatment for all critical COVID patients in Intensive Care Units.

The paper

“Review: Vitamin C – an Adjunctive Therapy for Respiratory Infection, Sepsis and COVID-19” was due to be published on December 7.

The abstract

There are limited proven therapies for the treatment of COVID-19. Vitamin C’s antioxidant, anti-inflammatory and immunomodulating effects, make it a potential therapeutic candidate, both for the prevention and amelioration of COVID-19 infection, and as an adjunctive therapy in the critical care of COVID-19, supporting anti-inflammatory treatment.

This literature review focuses on vitamin C deficiency in respiratory infections including COVID-19; the mechanism of action in infectious disease and adrenal function supporting the anti-inflammatory actions of glucocorticosteroids: its role in preventing and treating colds and pneumonia and its role in treating sepsis and COVID-19.

The evidence to date indicates that oral vitamin C (2-8g/d) may reduce incidence and duration of respiratory infections and intravenous vitamin C (2-24g/d) has been shown to reduce mortality, Intensive Care Unit and hospital stays, time on mechanical ventilation in severe respiratory infections.

Further trials are urgently warranted. Given the favourable safety profile and low cost of vitamin C, and frequency of vitamin C deficiency in respiratory infections it may be worthwhile testing patients’ vitamin C status and treating accordingly with intravenous use within ICUs and orally with doses between 2 and 8g/day in hospitalised and infected persons.

Authors

- **Patrick Holford**, Founder of the Institute for Optimum Nutrition
- **Anitra Carr**, PhD, Associate Professor, Nutrition in Medicine Research Group, Department of Pathology & Biomedical Science, University of Otago, Christchurch, New Zealand.
- **Dr Thomas Jovic**, MA, MB BChir, Stephen R Ali, BM, MRCS, and Prof Iain Whitaker (Chair of Plastic Surgery in Swansea University Medical School), Reconstructive Surgery

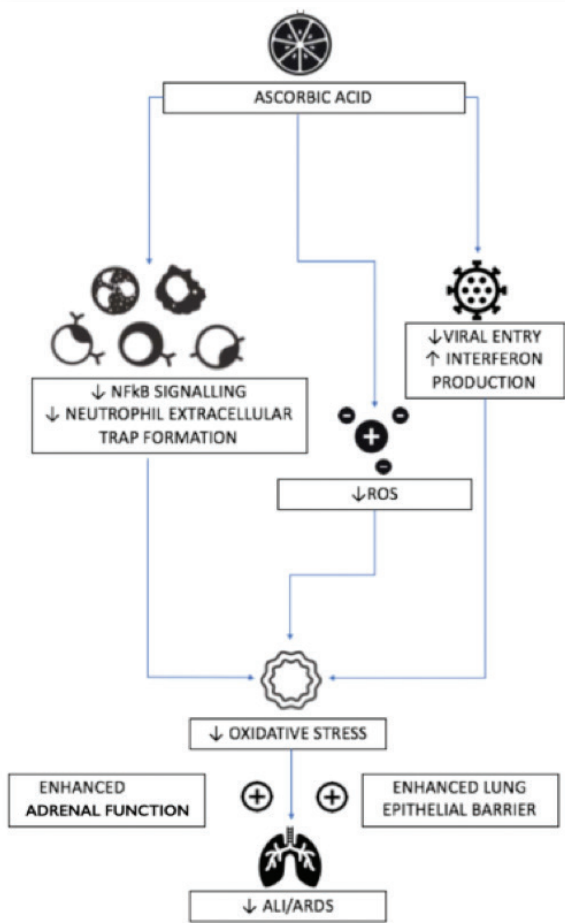


Figure 1: Postulated mechanisms for vitamin C's amelioration of COVID-19 pathology

→ & Regenerative Medicine Research Group, Institute of Life Sciences, Swansea University Medical School, and the Welsh Centre for Burns & Plastic Surgery.

- **Prof Paul Marik**, MD, Professor of Medicine and Chief of Pulmonary and Critical Care Medicine, Eastern Virginia Medical School.
- **Prof David Smith**, MA, DPhil, FMedSci, Professor Emeritus of Pharmacology, University of Oxford.

The review ticks all the boxes, not only laying out the many positive studies on vitamin C and respiratory diseases, but also documenting evidence of low vitamin C status in infection. This includes two recent COVID-related studies: one in the US showing the majority of 21 critically ill COVID-19 patients admitted to ICU had hypovitaminosis C; and another in an ICU in Barcelona showing that of 18 COVID-19 patients with acute respiratory distress syndrome (ARDS), 17 had undetectable levels of vitamin C.

Closer to home, the UK's National Diet and Nutrition Survey, based on a cross section of the UK population, has reported that 4% of 65+ year olds have extremely low vitamin C levels.

The paper highlights the connection between vitamin C, COVID and pneumonia. There is a historical connection: "In the early literature, scurvy was associated with pneumonia", it says. (It is worth pointing out here that researchers now believe that most of the deaths due to Spanish Flu were caused by bacterial pneumonia.)

A recent study from New Zealand, also published in *Nutrients*, has reported patients with pneumonia had depleted vitamin C status compared with healthy controls.

"The more severe patients in the ICU had vitamin C $\leq 11 \mu\text{mol/l}$. The total pneumonia cohort comprised 62% with hypovitaminosis C and 22% with vitamin C $\leq 11 \mu\text{mol/l}$, compared with only 8% hypovitaminosis C and no cases $\leq 11 \mu\text{mol/l}$ in the healthy controls".

Experts the government cannot ignore?

The review piloted by UK nutrition pioneer Patrick Holford, who was a student of double Nobel Prize-winner Prof Linus Pauling – an early proponent of vitamin C – gains extra weight from the experience of the co-authors. We'd like to think they are of sufficient prestige to make the UK government sit up and take notice.

- One of the big names is **Prof David Smith**, the emeritus professor of pharmacology in the University of Oxford's medical sciences division.

The Smith Group at Oxford's Department of Pharmacology is one of the most authoritative and experienced in the world. It investigates the role of micronutrients, especially B vitamins, in relation to functioning of the brain, in particular in prevention of Alzheimer's dementia, and in the causation of obesity.

Prof Smith's Oxford Project to Investigate Memory and Ageing (OPTIMA) is one of the longest-running and largest studies on dementia in the world. It produced ground-breaking research suggesting that adequate homocysteine-lowering B vitamins combined with EFAs, could potentially prevent and/or reverse Alzheimer's. A second field of research has discovered – and continues to investigate – an association between high plasma cysteine and increased fat mass.

"Nutrition is a good example of Pharmacology in practice", says the group, "since it involves the study of the interactions between small molecules (micronutrients) and tissues of the body. Our research deals with how abnormal nutrient status can lead to diseases like dementia and obesity. We study human populations and measure the micronutrients and their markers by mass spectrometry and by microbiological assay methods".

- **The Swansea team** – all from a university medical school – contributes expertise from treatment of patients critically ill with severe burns, sepsis and septic shock. Meta-analyses from that field show the important contribution made by vitamin C treatment – reducing time spent in ICUs and, significantly for COVID, reducing the need for mechanical ventilation.

- Another co-author, **Prof Paul Marik**, is a founding member of the Front Line Covid-19 Critical Care Alliance, a pioneering group of eminent critical care specialists who include oral or intravenous vitamin C (depending on the patient's levels) in their successful protocol for treatment of hospitalised COVID-19 patients. Their protocol incorporating vitamin C has massively reduced mortality rates in hospitalised COVID patients and has won international attention.

The FLCCA website lists relevant studies at <https://covid19criticalcare.com/medical-evidence/ascorbic-acid>, commenting:

"Numerous studies of the profound physiologic and clinical impacts of intravenous ascorbic acid (AA) in critical illness states have been published over the past two decades. The publications below range from multiple studies in septic shock demonstrating large outcome improvements, to CITRIS-ALI, the NIH funded multi-centre randomised controlled trial in ARDS which found that high dose intravenous AA led to a statistically significant reduction in mortality. Timeliness of administration, i.e. the need for early infusion at the onset of critical illness is a variable that has been poorly accounted for in many trials of intravenous AA and is well-illustrated in multiple studies below".

- **Prof Anitra Carr**, Director and Principal Investigator of the Nutrition in Medicine Research Group at New Zealand's University of Otago, is one of the world's leading researchers into vitamin C in health and disease. She was lead author on the recent paper, "Patients with Community Acquired Pneumonia Exhibit Depleted Vitamin C Status and Elevated Oxidative Stress". Two of her highly-cited studies were behind the most recent increase of the US recommended dietary intakes for vitamin C.

→ Building on vitamin C's known mechanism of action versus infection, the review authors have also proposed a mechanism for how C might work against COVID (see graphic page 12). One key aspect of this is vitamin C being released from the adrenal cortex as a stress response, and so "potentiates the anti-inflammatory and endothelial cytoprotective effects of glucocorticoids".

A crucial point from the review is the need to sustain vitamin C levels throughout infection, whether in severely ill patients or not. The authors state: "There is clear evidence that vitamin C levels decline precipitously in critically ill patients, and in those with sepsis. Although 0.1 g/day of vitamin C can maintain a

normal plasma level in a healthy person, much higher doses (2-3 g/day) are needed to keep plasma vitamin C levels of critically ill patients within the normal range. Being water-soluble, and thus excreted within hours, frequency of dose is important to maintain sufficient blood levels during active infection".

Is there direct evidence for vitamin C against COVID? The answer is yes. The review summaries results from one pilot RCT, three that are underway, and case reports of different protocols.

These results include:

- At the Chelsea and Westminster hospital ICU, where adult ICU patients were administered 1g intravenous vitamin C every 12 hours,

together with anticoagulants, they reported 29% mortality compared to the average 41% reported by the INARC (Intensive Care National Audit and Research Centre) for all UK ICUs. (This is a stupendously low dose.)

- The Frontline COVID-19 Critical Care Expert Group, a group of emergency medicine doctors treating hospitalised COVID-10 patients, have shown that by combining 6g/day IV vitamin C – 1.5 g every 6 hours, plus steroids and anticoagulants, they can get mortality down to 5.1%. They proved this in two ICUs in the US (United Memorial Hospital in Houston, Texas and Norfolk General Hospital in Norfolk, Virginia) and posted the lowest mortality in their respective counties. [MRCAN](#)

A new tweak to vitamin C: its effectiveness against COVID-19 may hinge on transporter levels

Age, race, gender, as well as expression levels and genetic variations of vitamin C transporters that make them less efficient may all be factors confounding the effectiveness of vitamin C therapy against COVID-19, say investigators at the Medical College of Georgia Centre for Healthy Ageing.

There are at least 30 clinical trials underway in which vitamin C, alone or in combination with other treatments, is being evaluated against COVID-19, some with doses up to ten times the recommended 65-90mg daily dose of vitamin C.

But whether or not vitamin C can get inside cells is likely to be one of the deciding factors in C's effectiveness, says Dr Carlos Isales.

In fact, without adequate transporters on a cell's surface to get the water-soluble vitamin past the lipid layer of cell membranes, particularly large doses may enable the vitamin to cluster around the outside of cells where it actually starts producing oxidants, like damaging reactive oxygen species, rather than helping eliminate them, he says.

"We think it's important to look at transporter expression", says Dr Sadanand Fulzele, the article's corresponding author.

They suspect low transporter expression is a factor in the mixed results from vitamin C's use in a variety of other conditions. However, use of vitamin C in other viral-induced problems, like potentially deadly sepsis, has shown benefit and it has reduced organ failure and improved lung function in acute respiratory distress syndrome, which is also a major cause of sickness and death with COVID-19.

Fulzele, who works on vitamin C in ageing,

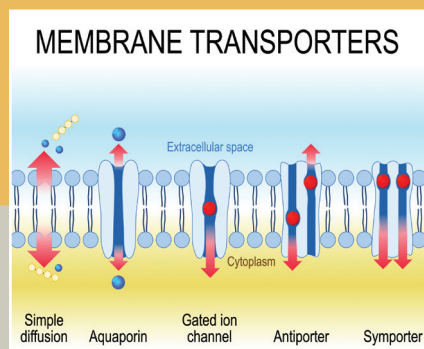
and others have shown that some conditions, like osteoarthritis and even normal ageing, are associated with significant downregulation of at least one subtype of vitamin C transporter.

In fact, part of the paradox and concern with COVID-19 is that those most at risk mostly have both lower levels of vitamin C before they get sick and fewer transporters to enable the vitamin to be of benefit if they get more, Fulzele says.

Many of those most at risk from COVID-19, including individuals who are older, black, male and with chronic medical conditions like osteoarthritis, hypertension and diabetes, tend to have lower levels of vitamin C, another reason vitamin C therapy would be considered a reasonable treatment, Isales says. The investigators also note that patients may develop a vitamin C deficiency over the course of their COVID-19 illness since, during an active infection, vitamin C is consumed at a more rapid rate. Insufficient levels can augment the damage done by an overzealous immune response.

While not routinely done, transporter expression can be measured today using PCR technology, a method also used for novel coronavirus as well as influenza testing. One of the research goals is to find a compound that will directly increase expression.

He notes that reduced transporter levels that occur naturally with age are a factor in the reduced immune function that also typically accompanies ageing. That means that even when a 60-year-old and 20-year-old both have a healthy diet in which they consume similar, sufficient amounts of vitamin C, the vitamin is not as effective



at boosting the older individual's immune response. Reduced immune function in older individuals is known to put them at increased risk for problems like cancer and COVID-19.

Low vitamin C levels also have been correlated with higher mortality in older individuals from causes like cardiovascular disease. High oxidative stress, a major factor in conditions like cardiovascular disease as well as ageing and now COVID-19, also is associated with significantly reduced expression of the vitamin C transporter.

- **IHCAN comment:** One answer to the problem of getting big doses of water-soluble C into cells – identified in this study – is to use a liposomal form that eases transport across hydrophobic membranes.

Good Health Naturally, suppliers of CureC™ Liposomal Vitamin C, claim that a liposomal delivery system enhances bioavailability to such an extent that liposomal C may be up to 9x better absorbed.

"The first uses of liposome science can be traced back to the 1960s, but within the past 40 years, we have seen this valuable technology go mainstream", they say. "When key nutrients are encapsulated in liposomes, or tiny bubbles of healthy fat, a supplement's delivery system is changed completely". The nutrient is encapsulated in a phospholipid. Cells have a phospholipid bilayer that is hydrophobic and lipophilic, meaning the vitamin-liposome is able to permeate the membrane more easily.