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Vitamin B1 Is Vital to Protect Against Infectious Disease

Analysis by Dr. Joseph Mercola ✔ Fact Checked | January 31, 2023

STORY AT-A-GLANCE

- Thiamine (vitamin B1) deficiency syndrome (beriberi) has many similarities to sepsis — a primary cause of COVID-19 mortality — and thiamine deficiency is relatively common in critically ill patients in general
- Thiamine deficiency is prevalent in pulmonary tuberculosis, and the more severe the case, the more severe the thiamine deficiency. Thiamine has been shown to limit Mycobacterium tuberculosis by regulating your innate immunity
- Thiamine deficiency is also associated with the development of high fever, and some researchers have suggested that serious infections may in fact be a presenting manifestation of thiamine deficiency
- Clinical case reports have shown thiamine injections reversed a number of acute illnesses in which high fever was a factor, including one case where the patient presented with high fever, headache and asphyxia, and another where the patient had high fever and severe pneumonia
- Thiamine is required for metabolism of some of the metabolites of vitamin C. Vitamin C also works synergistically with corticosteroids, which helps explain why the Marik Sepsis Protocol is so effective. Magnesium may also be important, as it is required for the activation of thiamine

From Dr. Joseph Mercola

Since COVID-19 first entered the scene, exchange of ideas has basically been outlawed. By sharing my views and those from various experts throughout the

pandemic on COVID treatments and the experimental COVID jabs, I became a main target of the White House, the political establishment and the global cabal.

Propaganda and pervasive censorship have been deployed to seize control over every part of your life, including your health, finances and food supply. The major media are key players and have been instrumental in creating and fueling fear.

I am republishing this article in its original form so that you can see how the progression unfolded.

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While a limited number of drugs have been enlisted in the treatment of severe coronavirus (SARS-CoV-2) infection, a number of nutritional supplements have risen to the forefront for their apparent usefulness. In addition to quercetin, zinc and vitamins C and D, vitamin B1 (thiamine) may be vital to protect against infectious respiratory illness.

Thiamine is also part of Dr. Paul Marik's sepsis treatment, which calls for 1,500 milligrams (mg) of intravenous ascorbic acid every six hours, 200 mg of thiamine every 12 hours and 50 mg of hydrocortisone every six hours.[1]

Sepsis, as you may have heard, is a major contributor in influenza deaths in general, and a primary cause for COVID-19 deaths specifically. In one clinical trial,[2,3] Marik, [formerly] a critical care doctor at Sentara Norfolk General Hospital in East Virginia, showed his treatment reduced sepsis-related mortality nearly fivefold.

More recent research,[4,5] published online January 9, 2020, found Marik's sepsis protocol lowered mortality in pediatric patients as well. At the 30-day mark, controls and the hydrocortisone-only groups had a mortality rate of 28% while the treatment group had a mortality rate of just 9%.

Vitamin C, Thiamine and Steroids Have Synergistic Effects

All three ingredients in Marik's sepsis protocol have synergistic effects, which seems to be why it's so effective. Vitamin C is well-known for its ability to prevent and treat

infectious diseases on its own.

Influenza,[6] encephalitis and measles[7] have all been successfully treated with high-dose vitamin C, and previous research has shown it effectively lowers proinflammatory cytokines and C-reactive protein.[8,9,10]

Vitamin C and corticosteroids, however, have been shown to work synergistically. This was demonstrated in a study[11] by Marik in collaboration with John Catravas, Ph.D., a pharmacology researcher at Old Dominion University, and others, in which endothelial cells from lung tissue were exposed to lipopolysaccharide — a type of endotoxin found in patients with sepsis — in the absence or presence of ascorbic acid and hydrocortisone.

Interestingly, when either vitamin C or the steroid was administered in isolation, very little improvement in endothelial barrier function occurred. When administered together, however, the infection was successfully eradicated and the cells were restored to normal.

The addition of thiamine (vitamin B1) is also important. Not only is thiamine required for metabolism of some of the metabolites of vitamin C, thiamine deficiency syndrome (beriberi) has many similarities to sepsis, and thiamine deficiency is relatively common in critically ill patients.[12]

As noted in a 1955 study,[13] thiamine deficiency is also prevalent in pulmonary tuberculosis, and the more severe the case, the more severe the thiamine deficiency.

Studies have also shown thiamine can be helpful for a long list of diseases and disorders, including mitochondrial disorders,[14] heart failure,[15] delirium,[16] thyroid fatigue and Hashimoto's (a thyroid autoimmune disorder).[17] These and other health effects may help explain why thiamine works so well in conjunction with vitamin C and hydrocortisone for sepsis.

You can learn more about Marik's sepsis protocol in "**Vitamin C — A Game Changer in Treatment of Deadly Sepsis**," along with commonsense recommendations for how to

lower your risk of sepsis in the first place.

You can also review Marik's PowerPoint presentation, "**Hydrocortisone, Ascorbic Acid and Thiamine for the Treatment of Severe Sepsis and Septic Shock**," presented at the 2020 Critical Care Reviews meeting in Australia.

Thiamine Deficiency Implicated in Severe Infections

Thiamine deficiency has also been implicated in severe infections specifically. A 2016 study[18] in the journal Psychosomatics sought to investigate this by looking at 68 patients with Korsakoff syndrome, a memory disorder caused by severe thiamine deficiency.

While thiamine deficiency is often the result of alcohol misuse, it's also associated with chronic infections, poor nutrition and/or malabsorption. As explained by the Alzheimer's Association, "Thiamine helps brain cells produce energy from sugar. When levels fall too low, brain cells cannot generate enough energy to function properly."[19]

In the Psychosomatics study, they found that 35 of 68 Korsakoff patients suffered severe infections during the acute phase of the illness, including meningitis, pneumonia and sepsis. According to the authors, "Infections may be the presenting manifestation of thiamine deficiency."

Thiamine Helps Regulate Your Immune Function

Another study[20] published in 2018 found thiamine helps limit Mycobacterium tuberculosis (MTB) by regulating your innate immunity. According to this paper:

> *"... vitamin B1 promotes the protective immune response to limit the survival of MTB within macrophages and in vivo through regulation of peroxisome proliferator-activated receptor γ (PPAR-γ).*

Vitamin B1 promotes macrophage polarization into classically activated phenotypes with strong microbicidal activity and enhanced tumor necrosis factor-α and interleukin-6 expression at least in part by promoting nuclear factor-κB signaling.

In addition, vitamin B1 increases mitochondrial respiration and lipid metabolism and PPAR-γ integrates the metabolic and inflammatory signals regulated by vitamin B1 ... We demonstrate that vitamin B1 enhances anti-MTB activities in macrophages and in vivo by down-regulating PPAR-γ activity.

Our data demonstrate important functions of thiamine VB1 in regulating innate immune responses against MTB and reveal novel mechanisms by which vitamin B1 exerts its function in macrophages."

The Link Between Thiamine Deficiency and Fever

Thiamine deficiency is also associated with the development of high fever, and according to a letter to the editor,[21] "Is Parenteral Thiamin a Super Antibiotic?" published in the Annals of Nutrition & Metabolism in 2018, thiamine injections are "likely to eradicate microbial infections" causing the fever.

The authors cite some clinical case reports in which thiamine injections were able to reverse a number of acute illnesses in which high fever was a factor, including one case where the patient presented with high fever, headache and asphyxia (feelings of suffocation), and another where a comatose patient had high fever and severe pneumonia.

"... another laborer with much milder pneumonia, 38°C fever with few rales in the left lung died within 24 h, although a full dose of penicillin G was used, but no thiamin was given," the authors note.

"This sharp contrast between the two cases made such a deep impression that it was strongly remembered. Fifty-six years later, it became a life-saving suggestion for a critical case with fatal viral pneumonia."

The authors go on to detail an even more remarkable case involving a 38-year-old Chinese woman who was brought to the hospital with high fever (39 to 40 degrees C), pain, swollen legs and bloody sputum. Laboratory testing showed she was anemic and had low platelets, severe pneumonia, femoral thromboses and heart failure. She also tested positive for hepatitis C.

> *"An exhaustive identification study revealed that the pathogen of her pneumonia was diagnosed to be an unknown kind of virus,"* the authors note. *"Pulmonary lesions were extremely severe, strange, and rare with multiple small perforations in the left lung ...*
>
> *After 12 days of immunoglobulin, anti-viral, antithrombotic, and antipyretic medication, she was about to die when her family promptly carried her home ... At home, thiamin 200 mg and VB complex 1 ampule (containg thiamin 10 mg, riboflavin 2 mg, niacinamide 30 mg, pyridoxin 2 mg, pantothenic acid 1 mg) were injected thrice daily.*
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> *Temperature returned to normal after 2 days and leg edema disappeared in 5 days ... After 58 days, she was checked in the Beichen Hospital ... The results revealed a normal heart; hepatitis C negative ... less effusion in the left thoracic cavity; pleural thickness especially on the left side but no adhesion. Lung perforation was absent ... She thereafter enjoyed excellent health without any sign of embolism or pneumonia recurrence."*

About 10 months after her initial hospitalization, she underwent a second follow-up, which revealed normal blood counts and electrocardiography. Her lungs also looked completely normal on X-rays, "with no thickening or adhesion of pleura except for a few texture thickenings in the lungs."

According to the authors, this case made them wonder whether thiamine might be "a super antibiotic." "It seemed to be surely so and was emerging to be a powerful alternative in the event of antibiotics failing," they said.

Thiamine Deficiency Might Impact Pandemics

The World Health Organization has also published information about the importance of thiamine and how to prevent deficiency during major emergencies.[22] According to WHO:

> *"Thiamine deficiency occurs where the diet consists mainly of milled white cereals, including polished rice, and wheat flour, all very poor sources of thiamine. Thiamine deficiency can develop within 2-3 months of a deficient intake and can cause disability and death."*

Other evidence suggests thiamine insufficiency or deficiency can develop even faster than that, perhaps as quickly as two weeks, as its half-life in your system is only nine to 18 days.[23]

The WHO report also points out that "Thiamine deficiency occurs sporadically in people who are socially isolated, suffer loss of appetite and self-neglect" — a point that is particularly pertinent in current circumstances of global "shelter in place" requirements. What's more:

> *"The requirement of thiamine is increased when carbohydrates are taken in large amounts and is raised during periods of increased metabolism, for example, fever, muscular activity, hyperthyroidism and also during pregnancy and lactation. A diet based on polished rice is high in carbohydrates which augments the thiamine requirement and is compounded by a low thiamine content."*

Aside from rice, junk food of all kinds tends to be loaded with carbohydrates as well, which could necessitate a higher-than normal thiamine intake to prevent side effects of thiamine deficiency. In adults, thiamine deficiency is divided into two primary types:[24,25]

- Dry beriberi (thiamine deficiency with peripheral neuropathy) — Polyneuropathy with paraesthesia of the extremities (especially the legs), reduced knee jerk and other tendon reflexes, progressive severe weakness and wasting of muscles, and greatly increased susceptibility to infections.

- Wet beriberi (thiamine deficiency with cardiomyopathy) — Edema (especially of the legs, but also the trunk and face), high cardiac output, ventricular failure, sinus rhythm, dilatation of arterioles, depressed erythrocyte and leukocyte transketolase, elevated serum lactate and pyruvate, and pulmonary congestion with pleural effusions; death from congestive heart failure may occur abruptly.

By dramatically increasing susceptibility to infections, thiamine deficiency could potentially have the ability to impact the spread of just about any pandemic infectious disease.

The Importance of Thiamine in Septic Shock

With regard to sepsis — which is a primary reason why people die from COVID-19 — thiamine may be of vital importance. In a Journal of Thoracic Disease article with the evocative title, "Do Not Forget to Give Thiamine to Your Septic Shock Patient!" the authors stress that:[26]

> *"[Thiamine] is a water-soluble vitamin that is an indispensable constituent of cellular metabolism. A lack of this vitamin can, therefore, be potentially life-threatening ... Thiamine diphosphate, also known as thiamine pyrophosphate (TPP) ... is the most important and active form of this vitamin ...*
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> *Thiamine pyrophosphate ... acts in concomitance with magnesium to expedite various mitochondrial oxidative decarboxylation reactions.*
>
> *Thiamine pyrophosphate is necessary as a cofactor for branched-chain ketoacid dehydrogenase complex essential for the metabolism of the branched-chain amino acids and for two critical complexes required for the mitochondrial synthesis of adenosine triphosphate (ATP): pyruvate and 2-oxoglutarate dehydrogenase (α-ketoglutarate) complexes ...*
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> *Also, TPP serves as a coenzyme for transketolase, a cytosolic enzyme implicated in the pentose phosphate pathway that functions in maintaining cell*

redox status through the production of NADPH (reduced nicotinamide adenine dinucleotide phosphate) and glutathione ...

Lack of thiamine leads to alterations in intermediate metabolism that end-up in lactic acidosis ...

Thiamine deficiency is also prevalent in septic shock patients, with rates ranging from 20% to 70% depending on the cutoff value used to define the presence of thiamine deficiency. Lack of thiamine reduces the flux of pyruvate to the Krebs cycle, thus increasing lactate production by altering the aerobic metabolism.

In a prospective, observational study, Donnino et al. investigated the relationship between thiamine levels and lactic acidosis in 30 septic shock patients ...

After excluding patients with abnormal liver function tests, the authors observed a significant negative correlation between thiamine concentrations and lactic acidosis, implying a potential association between thiamine levels and lactic acidosis in septic shock patients with normal liver function.

Thus, the possibility that by decreasing the activity of pyruvate dehydrogenase complex, thiamine deficiency can contribute to increased production of lactic acid in critically ill septic patients exists."

The authors cite additional research strongly suggesting "the administration of thiamine is advantageous in septic shock patients with severe thiamine deficiency (thiamine level $\leq$7 nmol/L)." Considering the safety of thiamine, even at high doses, the authors stress that "septic shock patients should be given thiamine ... without waiting for the results of thiamine level."

The European Society for Clinical Nutrition and Metabolism guidelines for patients in intensive care situations are 100 to 300 mg of thiamine per day "during the first three days in the ICU for all patients with suspected thiamine deficiency."[27]

In cases of septic shock, however, dosages of 500 mg may be required. According to "Do Not Forget to Give Thiamine to Your Septic Shock Patient!":[28]

> *"Because anaphylaxis has been reported in rare instances, guidelines in the United Kingdom have recommended that thiamine should be administered over 15- to 30-minute interval in a mixture of saline solution or dextrose, with the intention of averting potential adverse reactions."*

Vitamins C, D, Thiamine and Magnesium for Critical Illness

A 2018 report[29] in Intensive Care Medicine also focuses on thiamine — here in conjunction with vitamins C and D. It cites research showing septic shock patients with thiamine deficiency who were given thiamine had far lower mortality (13%) than those who did not receive it (46%).[30] They were also far less likely to suffer kidney failure.

Like thiamine, acute vitamin C deficiency is very common during critical illness yet tends to go unnoticed. As noted in this report, "Acute vitamin C deficiency may contribute to hypotension, exaggerated inflammation, capillary leakage, microcirculatory compromise, oxidative organ injury, and impaired immune defense and wound healing."

Vitamin D deficiency is also common, and can worsen illness and increase the risk of death from acute illness. According to the authors of this report:

> *"Preliminary data using novel methods suggest that glutathione and glutamate pathway metabolism, which are important for redox regulation and immunomodulation, are affected by vitamin D status ...*
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> *The VITdAL-ICU study (n = 475) did not find a difference in the length of hospital stay between groups, but there was a significant reduction in mortality in the predefined subgroup of patients with severe vitamin D deficiency. The most recent meta-analysis concludes that vitamin D in the ICU may be associated with mortality reduction."*

Surprisingly, **magnesium** has not been given much, if any, attention in all this. It may be just as important for the prevention and treatment of infection, however, seeing how magnesium is required for the activation of both thiamine[31] and vitamin D.[32,33,34]

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