

MAXIMIZING HEALTH SPAN WITH COMPOUNDED METHYLENE BLUE

There is a stark difference between increasing lifespan and maximizing health span. Health span is more than geroprotection. It involves enhancing cellular vitality and efficiency and improving *quality of life*. This is the difference between surviving and thriving. Here we discuss the opportunities for improving quality of life with compounded oral methylene blue.

What Is Methylene Blue?

A blue dye originally developed in the 19th century for the textile industry, methylene blue was soon found to be useful in microscopy to identify bacteria, parasites, and yeasts. In World War II, soldiers in the Pacific were required to take methylene blue as an anti-malaria medicine. For many years, methylene blue has been on the World Health Organization's List of Essential Medicines and is used in hospitals to treat methemoglobinemia as well as an antidote for chemical poisoning. Methylene blue is an old compound with many applications, but more recently it is being used to optimize mitochondrial efficiency and improve health span.

How Does Methylene Blue Work?

In short, methylene blue works selectively in mitochondria, repairing and optimizing their

function. In times of aging, chronic inflammation, trauma, hypoxia, and the excess presence of nitric oxide, mitochondrial function becomes compromised. Methylene blue acts upon cytochrome c oxidase, a crucial enzyme in the electron transport chain required for mitochondrial respiration and ATP production within the cell. Without appropriate cytochrome c oxidase function, the cell essentially suffocates, failing to deliver adequate oxygen to tissues and falling short on cellular ATP requirements. Methylene blue has been shown to extend the lifespan of human cells specifically by enhancing cellular oxygen consumption by 30–70%, increasing heme synthesis, and reversing premature senescence.¹

At low concentrations as recommended in this article, methylene blue forms an equilibrium between its oxidized and reduced forms and scavenges the body for cells with damaged or suboptimal mitochondrial function, repairing those first. Methylene blue effectively crosses the blood-brain barrier, making it particularly effective for improving conditions of the central nervous system, which rely heavily upon optimal mitochondrial function for energy.

Who Is a Candidate for Methylene Blue?

Alzheimer's

In late-onset Alzheimer's disease particularly, mitochondrial metabolism and glucose metabolism in the brain become impaired. Excess nitric oxide may also be responsible for brain cell death and accumulation around plaques in Alzheimer's and other

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forms of dementia.² Methylene blue may correct these damaging effects, restoring oxygen supply and cellular metabolism in the brain.

Memory and cognition

At a daily dose of 15mg, methylene blue works as a monoamine oxidase inhibitor, boosting serotonin (5-HT) for reduced anxiety and depression and improving memory retrieval speed, concentration, and focus on attention-related tasks. Improvement is shown following just one dose.^{3,4}

Viral and flu-like syndromes

Cancer patients, the elderly, and those at increased risk for contracting a viral infection and exhibiting a weakened immune response may benefit from the antiviral benefits of methylene blue. In a French study that included 2,500 cancer patients, none of those treated with methylene blue developed viral illnesses or flu-like syndromes during the recent pandemic. Types of cancers present in study subjects were primarily breast, lung, prostate, and colon cancer.⁵

Depression

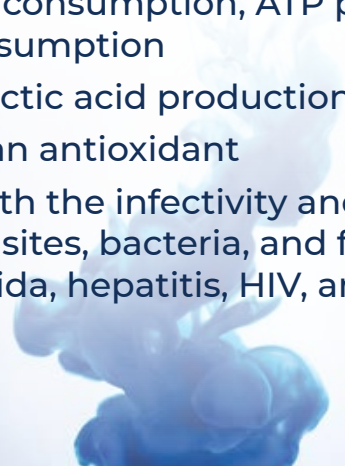
Methylene blue lowers nitric oxide, stress, inflammation, neurotoxicity, and therefore the effect of rebounding depression. One study reported that severely depressed participants given just one dose daily of methylene blue showed significant improvement when compared to placebo.⁶

Autism

Due to its hallmark of high oxidative stress, individuals with autism frequently present with excess production of endotoxins and metabolic dysfunction. A 2010 landmark study found that children with autism are far more likely to be deficient in cellular energy production than

FAST FACTS ON METHYLENE BLUE

- Improves mitochondrial function and respiration via the electron transport chain
- Improves O₂ consumption, ATP production, and glucose consumption
- Decreases lactic acid production
- Behaves as an antioxidant
- Interferes with the infectivity and lifecycle of viruses, parasites, bacteria, and fungi (including *E. coli*, *Candida*, hepatitis, HIV, among others)⁹



healthy children.⁷ Treatment with methylene blue may improve mitochondrial function and energy production within the mitochondria of brain cells, both of which are typically suboptimal in those with autism.

Pain

Types of pain reported to improve with oral methylene blue include post-op pain, chronic shooting pain, arthritis, migraine headaches, chronic low back pain, and pain due to ischemia. A few hours following oral methylene blue administration, painful inflammation of nerves is reported to subside.⁸

Dosing Methylene Blue

For most indications, dosing patients within 0.5–2mg/kg per day is sufficient for decreasing symptoms and improving health span. Therefore, most doses fall between 10–60mg daily.

IMPORTANT! More is *not* always better. Why? Methylene blue exhibits a hermetic response, exhibiting different effects at low versus high doses. At low doses appropriate for the

patient, methylene blue works as a nootropic, and at high doses it can promote free radicals. When dosed appropriately, methylene blue is intended to lower free radical damage. The time to peak concentration following oral dosing of methylene blue is 1–2 hours.



PRO TIP:

Use red light therapy in conjunction with methylene blue to synergistically maximize mitochondrial respiration and accelerate recovery of metabolically defective cells.

Clinical Considerations

- Drug-drug interactions: Concurrent use of methylene blue with SSRIs, SNRIs, MAOIs, and other products which increase serotonin levels in the brain should be used with caution. Concurrent use, however, is *not* a contraindication.

- Monitor and avoid use in patients with G6PD deficiency (hemolysis).
- Do not use methylene blue in patients who are pregnant or breastfeeding due to lack of data.
- Side effects are rare when dosed under 2mg/kg per day and generally include

aquamarine-colored urine roughly 4–12 hours following oral administration.

Methylene blue at low doses selectively promotes mitochondrial respiration and cellular energy production. Long-term mitochondrial optimization is crucial for maintaining high levels of energy, oxygen transport,

and protection against common pathogens, chronic inflammation, and premature cellular senescence. Methylene blue offers many opportunities to improve patient outcomes while reducing polypharmacy and should be strongly considered as a part of your health span extension protocol for patients.

REFERENCES

- ¹Atamna H, et al. Methylene blue delays cellular senescence and enhances key mitochondrial biochemical pathways. *FASEB J.* 2008;22(3):703-712. doi:10.1096/fj.07-9610.com
- ²Sonntag KC, et al. Late-onset Alzheimer's disease is associated with inherent changes in bioenergetics profiles. *Sci Rep.* 2017;7(1):14038. doi:10.1038/s41598-017-14420-x
- ³Rodriguez P, et al. Multimodal Randomized Functional MR Imaging of the Effects of Methylene Blue in the Human Brain. *Radiology.* 2016;281(2):516-526. doi:10.1148/radiol.2016152893
- ⁴RSNA. Methylene Blue Shows Promise for Improving Short-Term Memory. June 28, 2016. https://press.rsna.org/timssnet/media/pressreleases/14_pr_target.cfm?ID=1888
- ⁵Henry M, et al. A cohort of cancer patients with no reported cases of SARS-CoV-2 infection: the possible preventive role of Methylene Blue. *Substantia.* 2020;4(1) Suppl 1:888. doi:10.13128/Substantia-888
- ⁶Naylor GJ, et al. A controlled trial of methylene blue in severe depressive illness. *Biol Psychiatry.* 1987;22(5):657-659. doi:10.1016/0006-3223(87)90194-6
- ⁷Giulivi C, et al. Mitochondrial Dysfunction in Autism. *JAMA.* 2010;304(21):2389–2396. doi:10.1001/jama.2010.1706
- ⁸Ueber schmerzstillende Wirkung des Methylenblaus (About the analgesic effect of methylene blue). 1980. pp. 493–494. https://www.zvab.com/servlet/BookDetailsPL?bi=1239519850&searchurl=an%3Dleppmann%2Ba%26sortby%3D20&cm_sp=snippet-_-srp1-_-title6
- ⁹Ansari MA, et al. Antifungal Action of Methylene Blue Involves Mitochondrial Dysfunction and Disruption of Redox and Membrane Homeostasis in *C. albicans*. *Open Microbiol J.* 2016 Feb 25;10:12–22. doi:10.2174/1874285801610010012

