



# Poison HOTLINE

1-800-222-1222

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*Did you know .....*

**A contraindication to the use of methylene blue is a known or suspected Glucose-6-phosphate dehydrogenase (G6PD) deficiency.** G6PD is a key enzyme in the formation of NADPH. G6PD-deficient individuals generate insufficient NADPH to efficiently reduce methylene blue to leukomethylene-blue, which is necessary for the activation of the NADPH-dependent MetHb reductase system.

The deficiency is estimated to exist in almost 330 million people around the world, with highest prevalence in African, the Middle Eastern and Asian descendants. G6PD-deficient individuals are also prone to methylene blue-induced hemolysis.

Ascorbic acid, blood transfusions, and HBO therapy may be considered for MetHb management in G6PD patients.

## Why So Blue? Nitrate and Nitrite Poisoning

Nitrates and nitrites are nitrogen and oxygen compounds that occur naturally in the environment. Nitrogen is an important nutrient to plants and is commonly found in fertilizers. Organic nitrates are used in medicine as vasodilators (nitroglycerin, isosorbide dinitrate and isosorbide mononitrate, antidiarrheal drugs (bismuth subnitrate), and topical burn medicine (silver nitrate). Nitrates and nitrites are also used in preserving cured meats. Other forms of nitrites are sold as liquid incense or room deodorizers and may be inhaled for abuse purposes. While nitrite poisoning exposures are uncommon, reported cases include excessive use of any nitrate medications, drinking well water contaminated with nitrates from fertilizers, beverages inadvertently mixed with nitrite powders, as well as suicide attempts.

Nitrites induce toxicity by oxidizing the iron portion of red blood cells, ferrous iron (Fe<sup>2+</sup>) to ferric iron (Fe<sup>3+</sup>), leading to methemoglobinemia (MetHb). Unlike normal hemoglobin, MetHb is unable to carry oxygen, resulting in functional anemia, lowered oxygen delivery to the tissues, and the development of organ dysfunction. Blood containing methemoglobin may have a "chocolate-brown" appearance. Hemolysis may also be seen, further causing impaired oxygen delivery.

The severity of methemoglobinemia is proportional to the percent of red blood cells affected, though comorbidities may make certain individuals symptomatic despite a lower MetHb. Individuals with mild MetHb might appear pale and feel tired. When MetHb levels are 15% to 30%, the patient's skin may become bluish in color (cyanosis). Methemoglobin blood itself has a chocolate-brown appearance. Other symptoms include headache, hypotension, tachycardia, confusion, loss of consciousness, seizures, and arrhythmias.

Management essentials include prompt recognition, close monitoring, avoidance of MetHb-inducing substances, and early therapy. Provide oxygen with a non-rebreather mask, IV access, IV fluids, and possibly vasopressors. Treat with methylene blue if symptomatic (usually with MetHb levels >20-30%). Methylene Blue dosing: 1 mg/kg IV over 5 minutes. Therapeutic effects can be seen in minutes if diagnosis is correct.

Call 1-800-222-1222 for treatment recommendations for nitrate and nitrite poisoning. Toxicology consults are available 24/7.

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