

Feeling Blue – Depressed, Poisoned or Hypoxic?

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Professor of Clinical Emergency Medicine, UCSF

Medical Director, California Poison Control System – SF Division



Nothing to Disclose





I Feel Blue....



Dr. Jeff Tabas



Dr. Craig Smollin

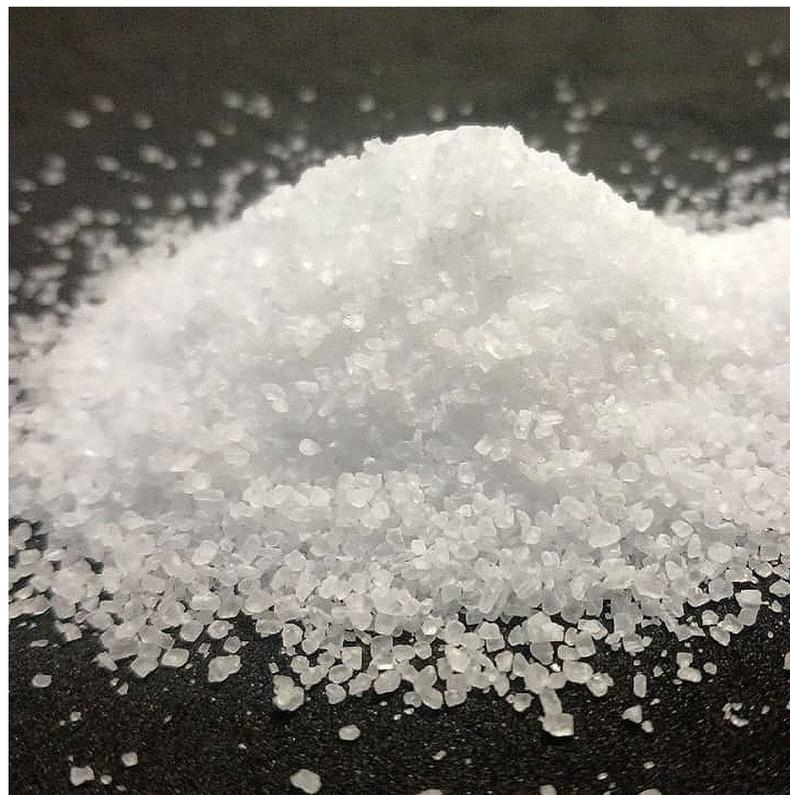
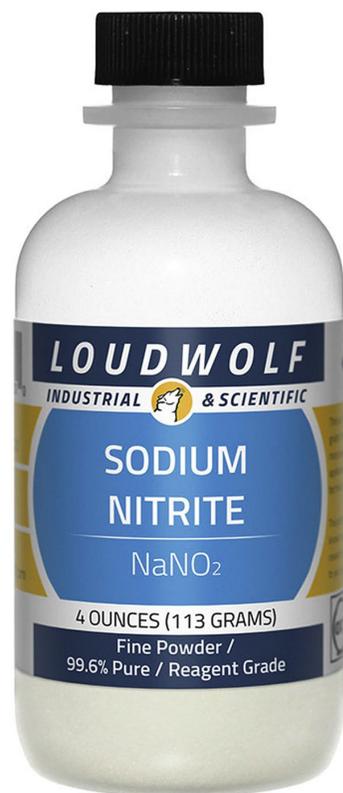


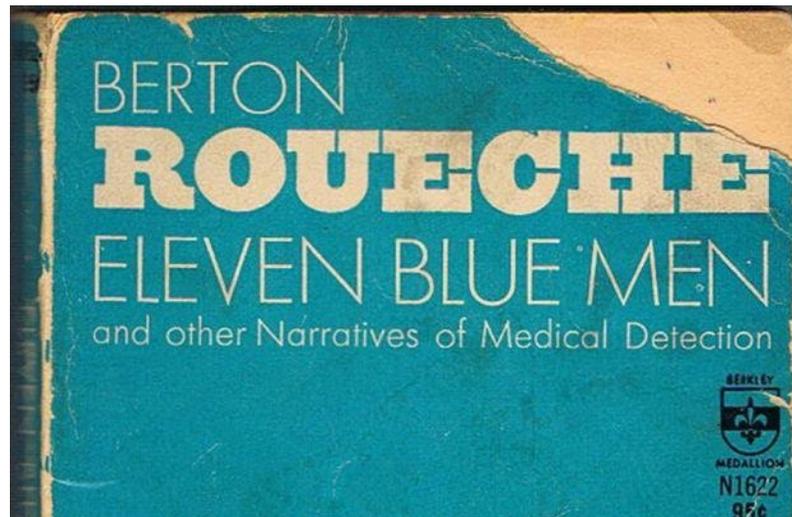


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- 16-year-old female ingested 60 grams of powdered **sodium nitrite** (99.6% by weight) dissolved in water.

What is Sodium Nitrite?





ANNALS OF MEDICINE JUNE 5, 1948 ISSUE

THE CASE OF THE ELEVEN BLUE MEN

How did a bowl of oatmeal source one of the rarest types of poisoning recorded in medical literature?



Back to results



Click image to open expanded view

Sodium Nitrite(Sinodream Technology) Purity 99.89%, Analytical Reagent 150 g

Brand: N\A

★★★★☆ 8 ratings

\$59⁰⁰ (\$5.90 /100 Items)

- Reagent employed in the reductive amination of aldehydes and ketones, and in the reductive alkylation of amines
- Lab chemical
- Sodium Nitrite Reagent
- Highly pure reagents

Specifications for this item

Brand Name	N\A
Ean	0754469466081
Number of Items	1000
Part Number	2110110344
UNSPSC Code	12000000
UPC	754469466081

\$59⁰⁰ (\$5.90 /100 Items)

FREE delivery April 27 - May 5. Details

Or fastest delivery April 26 - May 3. Details

Select delivery location

Usually ships within 1 to 3 weeks.

Qty: 1

Add to Cart

Buy Now

Secure transaction

Ships from SINODREAM TECHNO... Sold by SINODREAM TECHNO...

Details

Return policy: Eligible for Return, Refund or Replacement within 30 days of receipt

Add to List



I feel blue...

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- Somnolent, cyanosis, with clear lungs sounds bilaterally.
- ABG – pH 7.44, pCO₂ 31, pO₂ 307, O2 Sat 98%.



Physical Exam Findings





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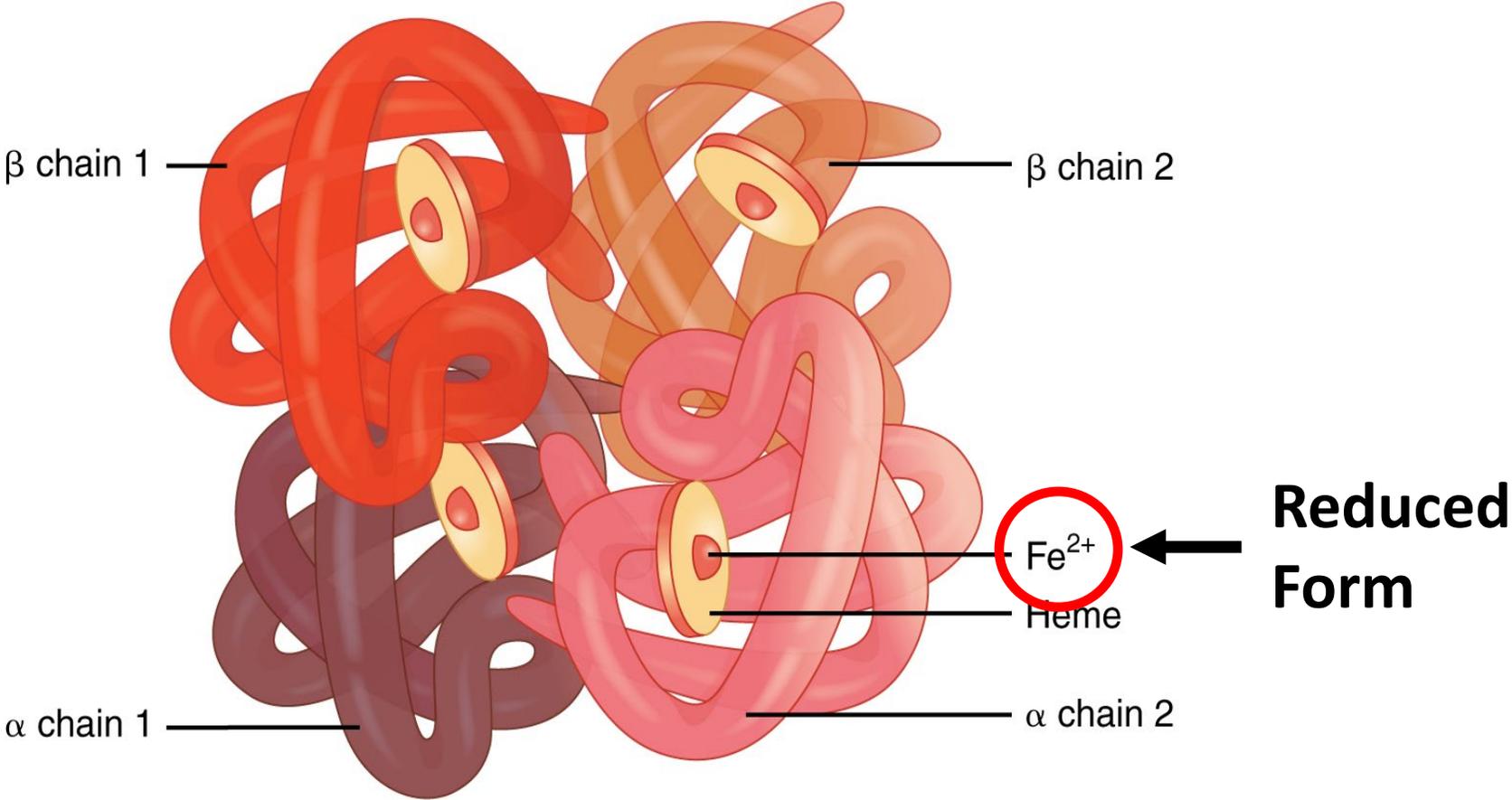
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What is your diagnosis?

Methgb Level = 44%

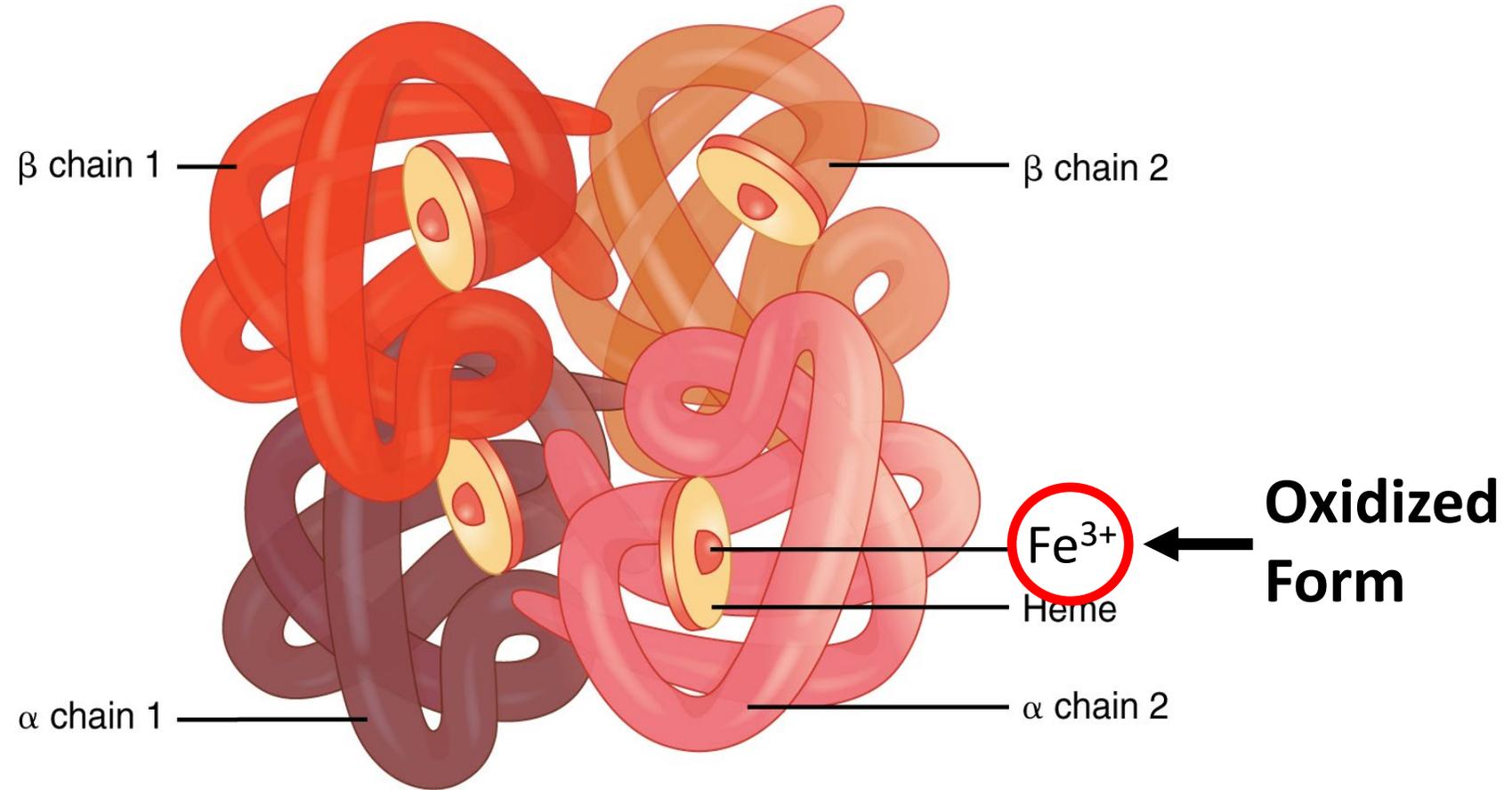


Hemoglobin



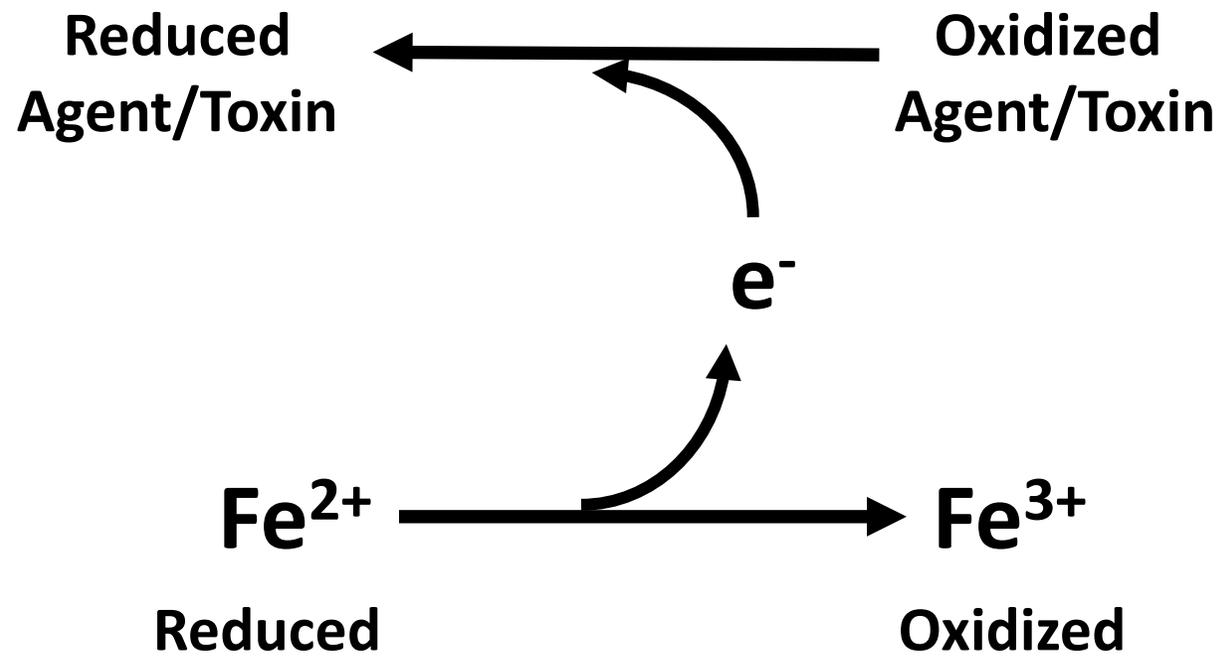


Methemoglobin





Fe²⁺
Reduced



Methgb Clues to the diagnosis



Cyanosis

“Chocolate” Colored Blood

“Saturation Gap”

Cyanosis

Bluish discoloration of the skin usually resulting from inadequate oxygenation of the blood.



For skin to appear cyanotic:

- 3.5 g/dL **deoxygenated hgb**
- 1.5 g/dL **methemoglobin**

Cyanosis is out of proportion to the degree of illness

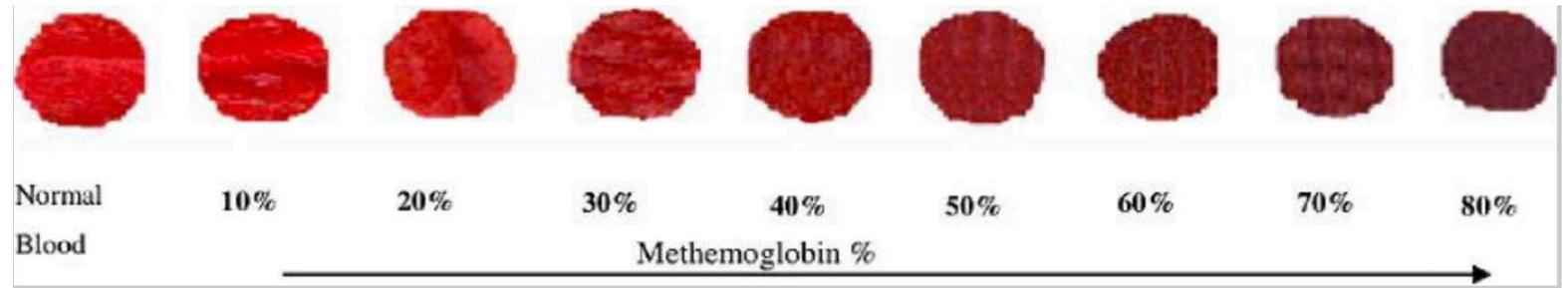
“Chocolate” Brown Blood



A Simple Quantitative Bedside Test to Determine Methemoglobin

[Fathima Shihana](#), BSc,^{a,b,*} [Dhammika Menike Dissanayake](#), MD, PhD,^{a,b} [Nicholas Allan Buckley](#), MD, FRACP,^{a,c} and [Andrew Hamilton Dawson](#), FRACP, FRCPa,d

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“Saturation gap”

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Causes of Acquired Methemoglobinemia

MEDICATIONS	OTHER XENOBIOTICS
Amyl nitrite	Aniline dye derivatives
Benzocaine	Chlorobenzene
Dapsone	Fires
Lidocaine	Organic nitrites
Nitric oxide	Naphthalene
Nitroglycerin	Nitrates (e.g.. well water)
Nitroprusside	Nitrites (e.g. foods)
Phenazopyridine (Pyridium)	Nitrophenol
Prilocaine	Nitrogen oxide gases
Quinones	Silver nitrate
Sulfonamides	Trinitrotoluene (TNT)

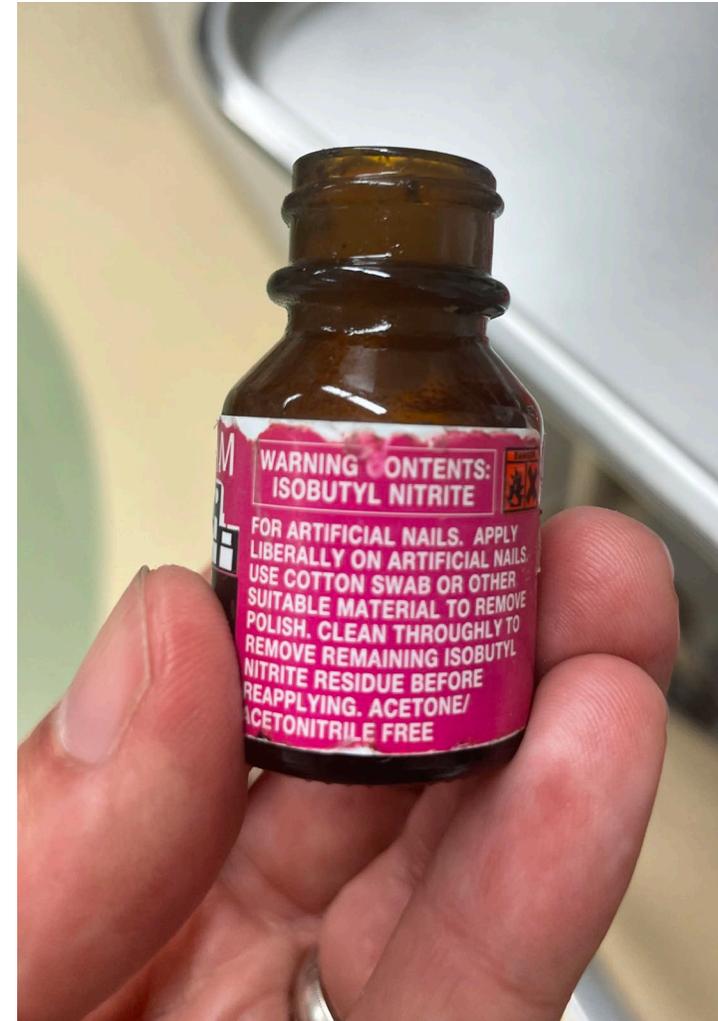
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Case #2 45-year-old male was found down unconscious in a parking lot. He appeared cyanotic. He received naloxone without improvement. Vital signs were significant for hypotension and tachycardia and an O2 sat of 83%. **Methgb = 36%**



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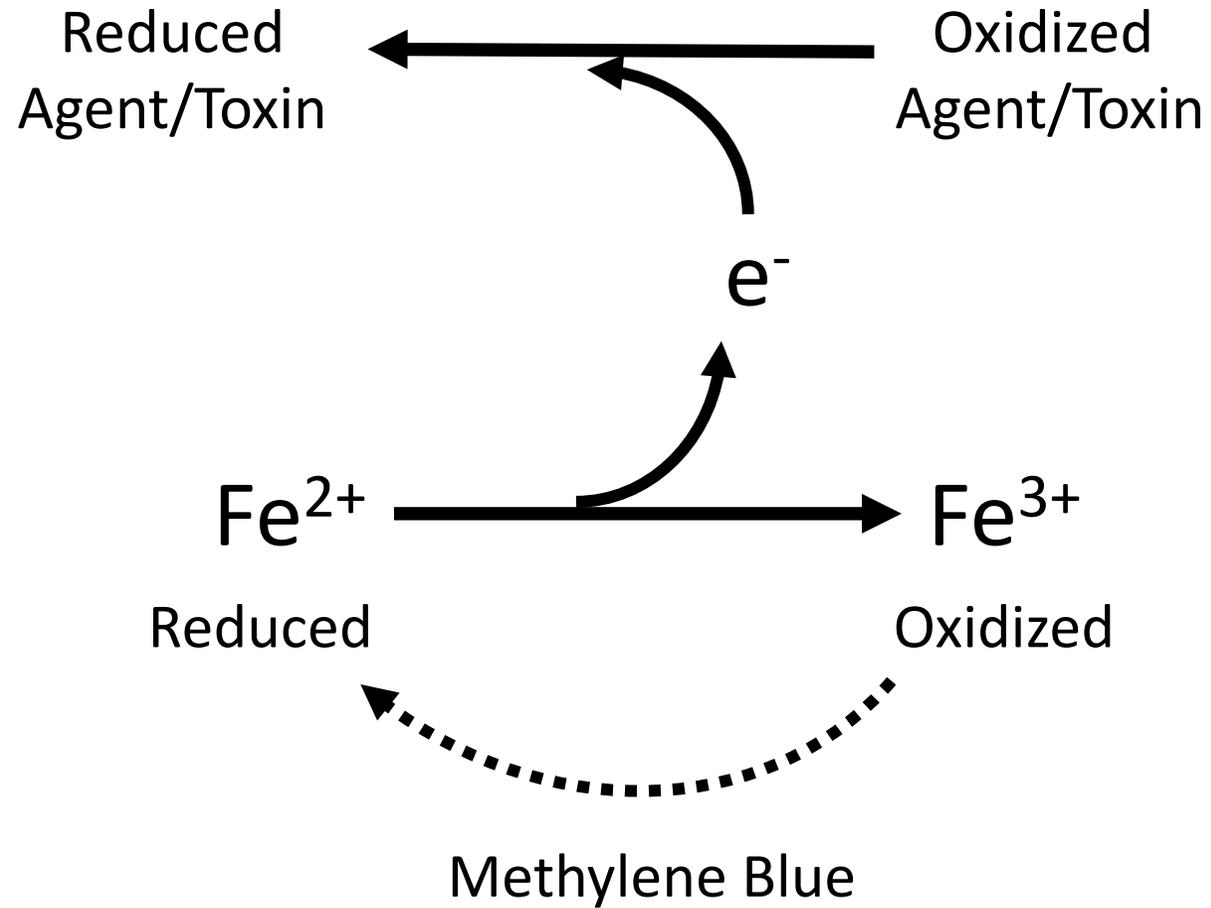


**"Poppers"
Amyl Nitrite**

Case #3 a 56-year-old male was given benzocaine spray 20% to facilitate nasogastric tube placement. Benzocaine was left at the bedside and was repeatedly self administered over the course of a day. He was found to be cyanotic with oxygen sat of 86%. **Methgb = 27%**



Methgb Treatment



Methgb Treatment

- Methylene blue 1%
- 1-2 mg/kg over 5 minutes
- Symptoms generally improve over 1 hour
- General rule treat when Methgb > 20%
- Methgb levels > 70% often fatal





Yellow and Blue Make Green





Methgb Alternative Treatments

- Transfusion or exchange transfusion
- Vitamin C (slow)
- Hyperbaric Oxygen?



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Selected Topics: Toxicology

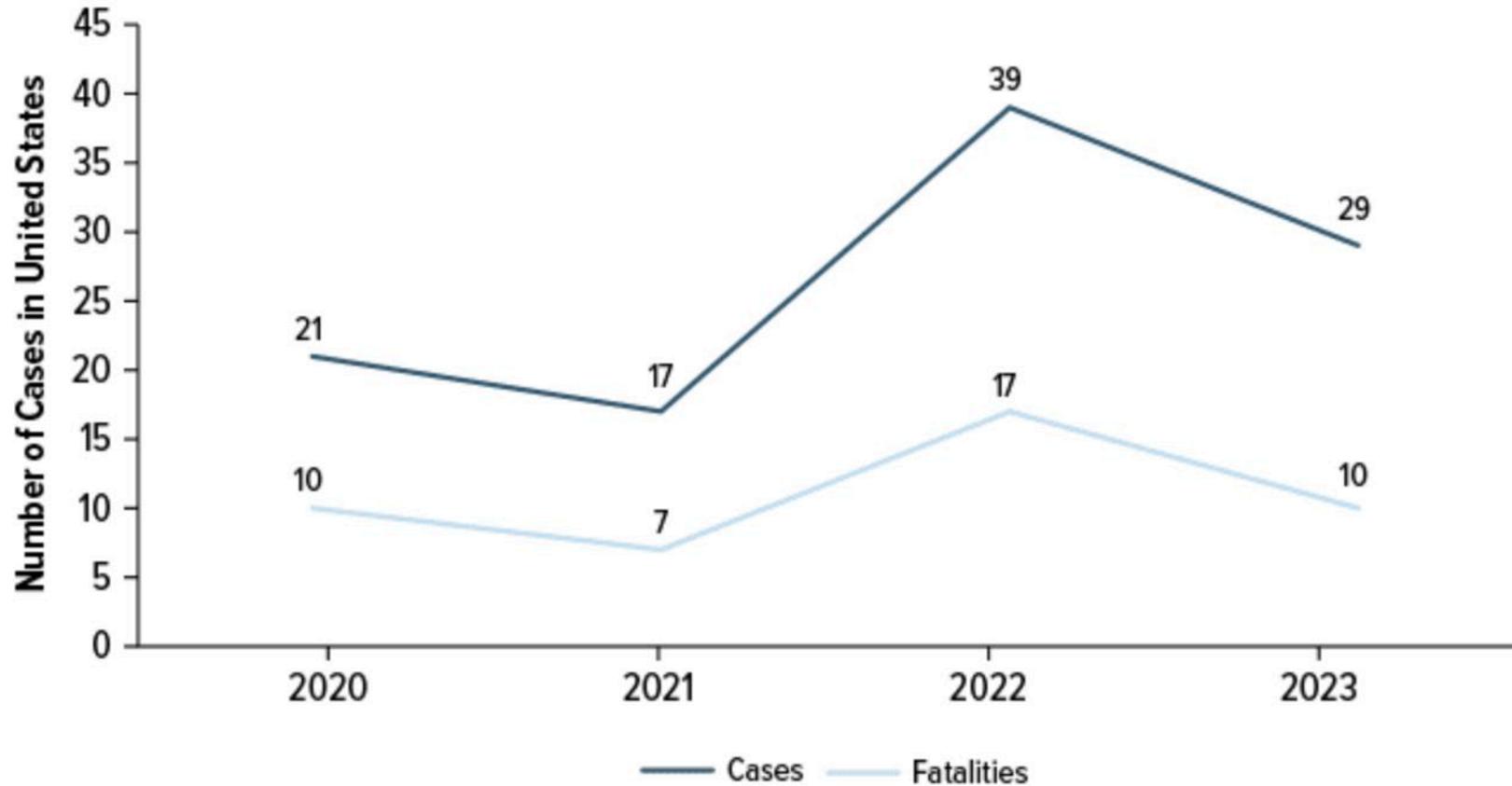
Severe Methemoglobinemia and Death From Intentional Sodium Nitrite Ingestions

Table 1. Details of the Five Sodium Nitrite Ingestion Cases Reported to CPCS

Pt	Age, Years	Sex	Estimated Amount Ingested (g)	Initial Blood Pressure (mm Hg)	Initial Heart Rate (beats/min)	Initial Oxygen Saturation	Peak Methemoglobin Level	Treatment	Outcome
A	18	M	15	109/58	95	90% (Post-methylene blue)	70.8%	Methylene blue (1.5 mg/kg)	Survived
B	16	F	60	101/59	128	76%	73%	Methylene blue (6 mg/kg), 2 units pRBCs	Survived
C	27	M	15	116/68	72	68%	> 32.4%	Methylene blue (2 mg/kg)	Died
D	16	F	Unknown	N/A	N/A	N/A	> 30	Methylene blue (2 mg/kg), 1 unit pRBCs	Died
E	25	M	113	98/64	95	80%	Undetectably high	Methylene blue (1 mg/kg)	Died

CPCS = California Poison Control System; Pt = patient; pRBCs = packed red blood cells.

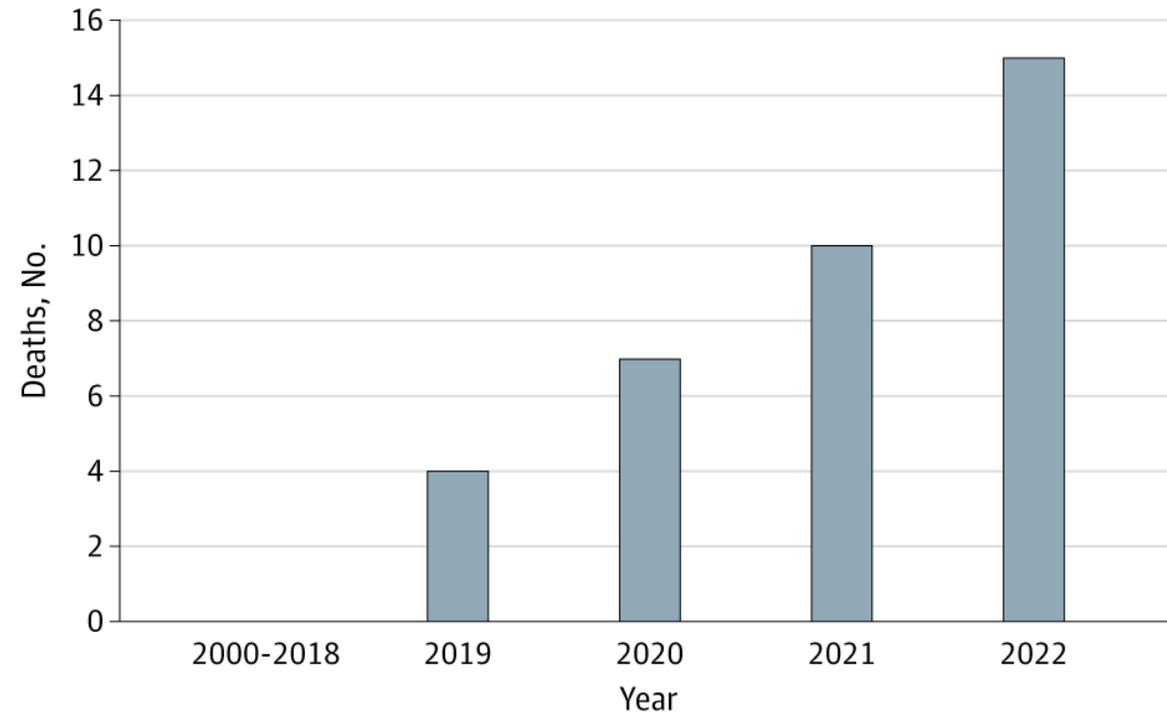
Intentional Sodium Nitrite Exposures Reported to the NPDS, 2020–2023



Abbreviation: NPDS = National Poison Data System.

From: **Comparing Confirmed Sodium Nitrite Suicide Deaths With Poison Center Surveillance Estimates**

JAMA Netw Open. 2024;7(9):e2434192. doi:10.1001/jamanetworkopen.2024.34192



Sodium Nitrite Deaths in New York City and Onondaga Medical Examiner Jurisdictions, 2000-2022

119TH CONGRESS
1ST SESSION

H. R. 1442

To ban the sale of products with a high concentration of sodium nitrite to individuals, and for other purposes.

IN THE SENATE OF THE UNITED STATES

APRIL 30, 2025
Received

JULY 16, 2025
Read twice and placed on the calendar

AN ACT

To ban the sale of products with a high concentration of sodium nitrite to individuals, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This title may be cited as the “Youth Poisoning Protection Act”.

SEC. 2. BANNING OF PRODUCTS CONTAINING A HIGH CONCENTRATION OF SODIUM NITRITE.

(a) IN GENERAL.—Any consumer product containing a high concentration of sodium nitrite shall be considered to be a banned hazardous product under section 8 of the Consumer Product Safety Act ([15 U.S.C. 2057](#)).



What did we learn?

- Methemoglobinemia involves oxidization of $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+}$
- There are a variety of causes (nitrites, dapsons, benzocaine etc.)
- Three important clues to the diagnosis:
 - Cyanosis, Chocolate colored blood, and a “saturation gap”
- Treatment is methylene blue (transfusion, vitamin C)
- Disturbing trend in sodium nitrite exposures in the United States

Questions?

