



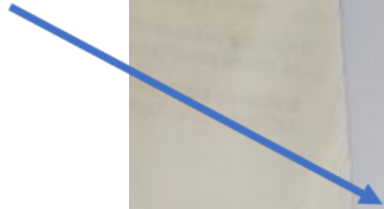
Case #45

NAME Educational Activities Committee

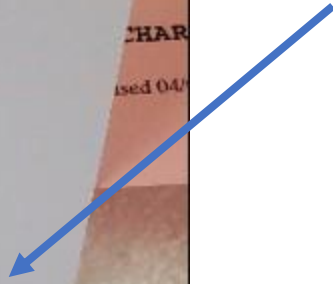
Case provided by:

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Control



Decedent's
sample



1. A 17-year-old man was found deceased on his bedroom floor. Emergency services responded but resuscitation efforts were unsuccessful. The mother stated that her son had been depressed and was spending more time on his computer. Scene investigators found an empty water bottle, EpiPen, mini-scale, and white granules on a nightstand. The decedent's medical records show he had a severe allergy to bee stings.

Cardiac blood was described as very dark when spotted onto a DNA card and compared to blood collected from a different case (Figure 1). Comprehensive toxicology testing showed therapeutic concentrations of melatonin, diphenhydramine, and omeprazole in femoral blood. Histology findings were negative. Based upon the totality of the information, what further testing is warranted?

- Gamma hydroxybutyrate (GHB)
- Sodium nitrite
- Sodium nitrate
- Cyanide
- Tryptase

Answer...

B. Sodium nitrite (49.34% responses)

Sodium nitrite is an oxidizing agent, causing methemoglobinemia. Ingestion causes iron in hemoglobin (Hb) to be oxidized from the normal ferrous [Fe²⁺] state to the ferric [Fe³⁺] state (methemoglobin, or MetHb). Iron in the [Fe³⁺] state results in allosteric changes to the Hb molecule that causes a leftward shift of the oxygen-dissociation curve. This leads to increased affinity of the [Fe²⁺] iron for oxygen and thus impaired release of oxygen to tissues. Symptoms are proportional to the methemoglobin level and include skin and blood color changes. Elevated methemoglobin concentrations turn the blood a chocolate-brown color. Lab testing can be done on serum/plasma, whole blood, tissue, and other fluids. Preferred sample would be whole blood in a gray top (sodium fluoride/potassium oxalate) tube. MetHb levels under 30% saturation do not produce deleterious effects. Levels between 30 - 50% saturation produce cardiovascular and CNS-depressant effects, e.g., headache, fatigue, tachypnea and tachycardia. Levels between 50 - 70% saturation will produce severe symptoms, e.g., respiratory depression, bradycardia, convulsions and acidosis. Over 70% methemoglobin saturation is an acute, life-threatening situation. Color changes of the blood can be seen in specimens as low as 20%.

For the presented case, the nitrates + nitrites concentration was 20000 mcM. This is very elevated. Normally, nitrites in blood range up to 0.35 mcM and nitrates range up to 53.1 mcM in adults.

Other Responses:

A. Gamma hydroxybutyrate (GHB) (7.14% responses)

GHB is an endogenous molecule, a prescribed medication for narcolepsy, and a substance of abuse. Administered exogenously, it quickly crosses the blood-brain barrier and readily enters the central nervous system. Overdoses provoke CNS and respiratory depression which can lead to coma and death. Most routine postmortem toxicology procedures do not include GHB and if implicated, concentrations should be analytically determined. GHB consumption does not cause dark blood, so its presence cannot be determined by visual inspection. Interpretation needs to consider case circumstances since GHB amounts can increase postmortem. Testing of an alternate matrix such as vitreous fluid can add clarity to a GHB blood concentration.

C. Sodium nitrate (19.77% responses)

Sodium nitrate is a colorless crystal or powder. Intoxication with a large sodium nitrate dose may only cause mild GI symptoms (e.g., vomiting and diarrhea) but more serious complications such as hypotension and bradycardia or tachycardia may develop. It is important to consider, however, that approximately 5% of all ingested nitrate is rapidly reduced to nitrite which can lead to methemoglobinemia. Because of in vivo conversion, even if nitrate ingestion is suspected, it is prudent to perform analytical testing that quantifies total nitrites and nitrates.

D. Cyanide (14.95% responses)

Cyanide is a rapidly acting and broad-spectrum poison that can cause death. The toxicity of cyanide is due to its inhibition of oxidative phosphorylation leading to cellular hypoxia, the depletion of ATP, and decreased tissue utilization of oxygen. Blood will have a cherry-red color due to excess oxygen in the bloodstream.

E. Tryptase (8.8% responses)

Tryptase concentrations increase with immediate hypersensitivity (anaphylaxis), acute allergen challenge, and mastocytosis. Because the decedent was in his room overnight, the likelihood of a bee sting is unlikely. Examination of the body showed no indication of an embedded stinger or localized inflammation, distinct edema or erythema of the glottis or laryngeal structures.

References

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