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## Treatment with hydroxocobalamin for cyanide poisoning: A rare cause of pseudohematuria

### Tratamiento con hidroxocobalamina para la intoxicación por cianuro: una causa rara de pseudohematuria

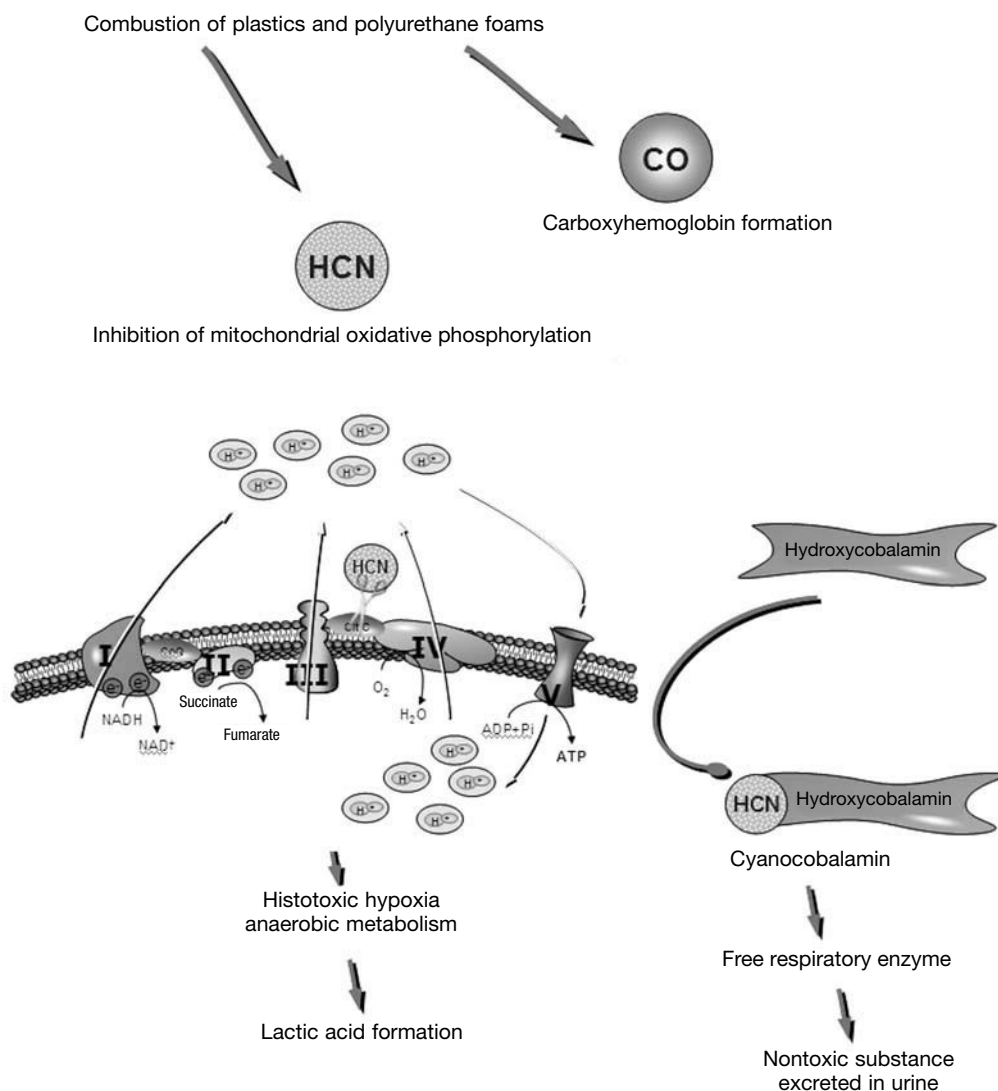
To the Editor,

A 59-year-old male was admitted to the Emergency Service of our hospital after triple suicide attempt, accompanied by manifest hematuria. The three suicide attempts comprised

setting the home on fire, followed by a failed shotgun shot to the head, and finally a fall from the thirteenth floor. Upon arrival in the Emergency Service, the patient was hemodynamically stable, the physical examination revealing



Figure 1 – (A) Left hemifacial trauma with important tissue loss due to gunshot wound. (B) Urine leakage is seen, with “Bordeaux red” staining.



**Figure 2 – Mechanism of action of hydroxycobalamin.**

left hemifacial trauma with mandibular, maxillary and left zygomatic fracture, abundant loss of facial tissue on the same side, and manifest bleeding through the bladder catheter. The patient was treated on an out-hospital basis with 5 mg of intravenous hydroxycobalamin (Cianokit®), due to the suspicion of smoke inhalation toxicity. The basic laboratory tests showed carboxyhemoglobin 5.4% and serum lactate 10.44 mmol/l. Thoracoabdominal computed tomography (CT) in turn discarded associated organ damage (fig. 1).

Changes in urine color have always posed uncertainties as a cause of consultation. Although such situations have been described and classified for a long time, there is still considerable unawareness of these conditions in modern practice. Hematuria is defined as the presence of red blood cells in urine<sup>1</sup>, and reddish staining can be seen with the naked eye when there are over 100 red cells per microscopic field. However, a range of endogenous and exogenous substances are also able to cause red staining of urine,

without actual hematuria. Such situations are referred to as pigmenturia, false hematuria, or pseudo-hematuria<sup>1,2</sup>. The study of hematuria is a priority concern in clinical practice, and an etiological diagnosis should be established as soon as possible<sup>3</sup>.

Exposure to smoke-heavy environments can lead to smoke inhalation syndrome. Many Emergency Services have adopted treatment regimens and protocols to deal with smoke inhalation, including basic life support measures, high-dose oxygen administration, and the administration of antidotes according to the circumstances of the causal event. Smoke intoxication occurs as a result of exposure to both irritating gases and asphyxiating gases. Carbon monoxide (CO) and hydrogen cyanide (HCN) are the main asphyxiating gases present in the smoke from fires<sup>4</sup>.

CO binds to hemoglobin, forming carboxyhemoglobin—thereby blocking oxygen transport and causing tissue hypoxia. The physiopathological mechanism underlying

HCN intoxication is based on its high affinity for metal ions such as  $\text{Fe}^{3+}$  or  $\text{Co}^{3+}$ , which in turn leads to binding and the inactivation of crucial body enzymes. Cyanide inhibits mitochondrial oxidative phosphorylation by blocking cytochrome oxidase C3a, thereby incrementing anaerobic glycolysis and thus the production of lactic acid. Accordingly, blood lactate concentration is the main marker of the presence of cyanide in patients with smoke inhalation syndrome. Concentrations above 10 mmol/l suggest that HCN is the cause of intoxication.

Since Emergency Services are not equipped with methods for diagnosing cyanide intoxication, empirical treatment is started without delay when such intoxication is suspected. Cobalt donors can be used – hydroxycobalamin (Cianokit®) being the agent used in our setting. This compound binds to cyanide, forming cyanocobalamin (vitamin  $\text{B}_{12}$ ). The chelation of cyanide prevents the latter from binding to cytochrome oxidase, and restores mitochondrial function<sup>5</sup>. The drug is administered at a dose of 2.5-5 g in continuous intravenous perfusion, over a period of 15 minutes. Hydroxycobalamin is relatively innocuous compared with the traditional antidotes composed of amyl nitrate, sodium nitrate and sodium thiosulfate. It has few side effects – the most common being pinkish coloring of the skin and urine, and transient hypertension<sup>6</sup> (fig. 2).

The presence of macroscopic hematuria in polytraumatized patients is an alarm sign requiring thorough complementary explorations to discard associated organ damage. When treating polytraumatized patients in the context of smoke inhalation, the administration of hydroxycobalamin as an antidote against cyanide intoxication produces pseudohematuria. Awareness of the increasingly accepted use of hydroxycobalamin in out-hospital care is required on

the part of emergency care physicians and urologists, since pseudohematuria is its main side effect.

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