Hydroxocobalamin as a Cyanide Antidote: Prehospital Use for Smoke Inhalation and Suspected Cyanide Releases

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Introduction: Cyanide is a chemical warfare and toxic terrorism threat agent. Credible cyanide terrorism threats have been reported in Japan, the United States (Chicago, Illinois, eastern Texas, the 1991 World Trade Center bombing), New Zealand, the United Kingdom, Italy, the Middle East, and elsewhere. In addition, cyanide, like carbon monoxide, is a main toxicant contained in fire smoke.

A safe, efficacious antidote is required for use by prehospital responders. Of the antidotes available in the United States, sodium nitrite can cause life-threatening hypotension when administered too rapidly and can induce dangerous methemoglobinemia. Sodium thiosulfate alone acts too slowly. Hydroxocobalamin, a cyanide antidote with potential for use in the prehospital care setting, has been used in the prehospital setting for many years by the Brigade de Sapeurs-Pompiers de Paris (Paris Fire Brigade) in France.

Methods: Published studies involving hydroxocobalamin as a cyanide antidote were reviewed for evidence of safety and efficacy, and the experience of the Paris Fire Brigade Service de la Santë was reviewed.

Results: In in vitro and in vivo studies, hydroxocobalamin had efficacy similar to that of other available antidotes. In heavily smoking, normal, human volunteers, the administration of hydroxocobalamin was safe and efficacious in reducing low blood cyanide levels, although it was associated with a mild, transient elevation in blood pressure. Of 81 victims of smoke inhalation from enclosed-space fires in Paris, 18 of 29 who were in cardiac arrest recovered after hydroxocobalamin administration, and 12 of 15 with initial hypotension had clinical improvement. Adverse effects include transient dark red-brown discoloration of urine, skin, sclera, and mucous membranes from the color of the compound itself. Hypertension has not been observed in smoke-inhalation victims treated empirically for cyanide poisoning. Allergic reactions rarely have occurred with chronic low doses, but have not been reported following antidotal doses.

Discussion: Hydroxocobalamin has been used successfully in the prehospital setting. Even if the clinical diagnosis is incorrect, administering hydroxocobalamin is unlikely to result in harm. Hydroxocobalamin is a potentially useful product that could be administered safely when there is clinical suspicion of cyanide poisoning from either smoke inhalation or in a toxic terrorism mass-casualty situation.

Conclusion: Hydroxocobalamin is the antidote of choice in France and has been shown to reduce cyanide levels with no apparent safety issues in vitro, in smokers, and in cyanide-poisoned victims in the prehospital setting. The experience of the Brigade de Sapeurs-Pompiers de Paris suggests that hydroxocobalamin should be considered for stocking and use by prehospital emergency medical services providers and hospital-based emergency physicians.

Keywords: antidotes; cyanide; hydroxocobalamin; Paris Fire Brigade; prehospital; sodium nitrate; sodium thiosulfate; toxins
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Emergency Department-Based Enhanced Bioterrorism Surveillance System: Experience in Korea

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Introduction: The threat of bioterrorism after 11 September 2001 in the US and the preparations for the 2002 Korea-Japan FIFA World Cup Game required an improved bioterrorism detection system. Emergency health professionals may be the first persons in contact with the victims of a bioterrorism attack, so an emergency department-based bioteror syndromic surveillance system was needed to allow for the early detection of a bioterrorist attack. The use of a routine bioterrorism syndromic, surveillance system began on 13 May 2002, and temporary enhanced syndromic surveillance systems were maintained for use for the Universiad Game in 2003 and the Asian Development Bank (ADB) meeting in 2004.

Methods: Data from Websites and computer servers were analyzed for the Universiad Game from 11 August to 14 September 2003, and for the ADB meeting from 6–31 May 2004. Data were gathered every day from 27 emergency departments, including the official Universiad Game Hospital for participants in the Universiad Game system and from eight emergency departments on Jeju Island for the ADB meeting, from Internet reports, faxes, and direct visitations. For the ADB surveillance system, emergency departments in designated hospitals corrected their electronic medical system and patient log books as directed by experts. Researchers analyzed the data daily and reported the results to the Korean Center for Disease Control. The odds ratio originating from syndrome to none ratio was used for aberration detection method, and the chi-square test was used for statistical analysis.

Results: An enhanced syndromic surveillance of the 2003 Universiad Game in Daegu, Korea, a specific Website for Universiad syndromic surveillance was prepared. The total number of patients included was 37,187, with 4,817 (12.7%) reported as syndromes. There were 31 episodes of aberration, but no clues were identified for bioterrorism attack or outbreak of infectious diseases.

When analyzing the enhanced syndrome surveillance of the 2004 ADB Meeting in Jeju Island, Korea, the reporting rate was perfect (100%). The total number of patients was 7,833, and 1,401 (17.9%) syndromes were reported. There were seven episodes of aberration and, also, no proof of biological terror or outbreak of infectious diseases.

Discussion: The enhanced syndrome surveillance system is a short-term, rapidly implemented, and event-specific system. It frequently includes active emergency department