cautions for infection such as changing gloves were simulated. The simulated total time to vaccinate 1,000 patients was just under four hours. Ambulance standby was arranged in case of actual illness of volunteers and in case screening uncovered any illness that would require immediate access to medical care. Security for clinic volunteers, healthcare workers, and vaccines also was simulated. Security was asked to screen for press credentials and direct all media to the designated public information officer (PIO) and to limit access to and protect the medical privacy of vaccine recipients. There was actual coverage of the simulation by local media. With these results regarding the required number of healthcare workers and required time to vaccinate 1,000 patients, numbers can be estimated for any size population depending on clinic operation hours of 12, 16, or 24 hours of operation. The number of healthcare workers required can be estimated depending on 8 or 12-hour shifts.

Keywords: clinic; healthcare workers; population; simulation; vaccination
Prehosp Disast Med 2005;20(2):s90–s91

Systematic Review of the Decontamination of Chemically Contaminated Casualties

I. W.F. Crawford; K.C. Mackway-Jones
Department of Emergency Medicine, Manchester Royal, United Kingdom

Introduction: In the event of a chemical incident, whether the consequence of an accidental or deliberate release of toxic industrial chemicals or chemical warfare (CW) agents, there is a requirement for first responders to decontaminate potentially contaminated casualties. The purpose of the decontamination process is to physically remove, neutralize or destroy, or reduce to an acceptable level any chemical contaminant present, thereby reducing harm to the casualty and preventing secondary contamination of the first responders.
Objectives: The aim of this study was to determine the most effective approach to the decontamination of chemically contaminated casualties, specifically the need for and timing of decontamination and the effectiveness of: (1) clothing removal as the initial step in the decontamination process; (2) different decontaminants; and (3) different decontamination methods.
Methods: A number of specific, three-part questions were compiled to address the aims of this systematic review. The resources accessed in an effort to identify the literature available in the public domain were: (1) The Cochrane Library; (2) MEDLINE; (3) EMBASE; (4) CINAHL; (5) Science Direct; (6) ISI Web of Science; (7) ISI Proceedings; and (8) The Batelle Memorial Institute Mass-Casualty Decontamination Database. The resources accessed to identify the (potentially) classified literature not available in the public domain and the countries in which they exist were:

1. United Kingdom—Defence Science and Technology Laboratories (DSTL) Knowledge Services;
2. United States—Department of Defense (DoD) Chemical Biological Information Analysis Center (CBIAC);
3. Canada—Defence Research & Development Canada (DRDC) Defence Research Reports Database; and
4. Australia—Defence Science and Technology Organisation (DSTO) Research Library.

Commercial manufacturers also were contacted. Studies were selected for inclusion based upon their relevance to the specific three-part questions. The studies could be published or unpublished scientific papers or technical reports.

Two reviewers independently selected the studies for inclusion and extracted relevant data. These data have been abstracted into evidence tables and appropriate conclusions have been drawn in the form of a series of clinical bottom-lines for each of the specific three-part questions.
Results: The results of the completed process will be presented.
Conclusions: A systematic review has determined the most effective approach to the decontamination of chemically contaminated casualties. The outcomes can be used to formulate best practice guidelines and advise first responders on the efficacy of the processes they already have in place and any changes that might be required for improvement.

Additionally, areas where further research is required have been identified.

Keywords: assessment; chemically contaminated casualties; decontamination; review
Prehosp Disast Med 2005;20(2):s91

Destruction of Conventional and Chemical Weapons from World War I (1914–1918), Ieper, Belgium—Example of Long-term Problems after War Situations

K. Vandevelde
Belgium

Six years ago, Belgian military authorities developed a Destruction Unit for ammunition remaining from World War I (WWI) in the area of Ieper, where several battles occurred. After WWI, thousands of tons of ammunition were dumped in the North Sea, at Zeebrugge, one kilometer from the coast. There are no available solutions for this problem in Zeebrugge. After the Oslo convention, dumping in the sea was forbidden. Historical stockpiles from WWI had to be destroyed. Between 1980–1996, 12,000 tons of ammunition were placed in Poelkappelle. Each year, 2,000 bombs are found, mostly by farmers. In April 2004, 70 tons of ammunition were discovered in one place. WWI was the first time chemical weapons were used on a large-scale basis.

The Explosion Services of the army can be called after finding projectiles. In the Destruction Unit, ammunition is separated into high explosive and toxic chemical (10%) weapons. A special procedure with nuclear, biological, chemical (NBC) clothing, RX apparatus, and spectrometrie is now available routinely in the Unit. There is an external and an internal disaster plan in the Destruction Unit.

One problem in case of accidents is the lack of knowledge by the medical rescue teams about the toxic effects and the treatment of war gasses (mustard gas, fosgeen, clark, etc.). Obligatory military service, the most important source of information about NBC problems during doctor and nurse education, no longer exists in Belgium.

Recent incidents have proven the danger of being unknowledgeable. For example, the attack on the Moscow Theatre resulted in many unnecessary victims due to poorly informed prehospital medical teams.

Conclusion: More education and information regarding such hazards should be available for medical rescue teams.

Keywords: ammunition; education; nuclear, biological, chemical (NBC); weapons; World War I (WWI)
Prehosp Disast Med 2005;20(2):s91-s92

The Bhopal Saga—Causes and Consequences of the World's Largest Industrial Disaster

I. Eckerman
Swedish Doctors for the Environment, Sweden

Introduction: The Bhopal Gas Leak in India, 1984 is the largest chemical, industrial event ever. A total of 520,000 persons were exposed to the gases, and up to 8,000 died during the first several weeks following the event. A total of 100,000 persons now suffer from permanent injuries. The catastrophe has become the symbol of negligence to human beings from transnational corporations. Industrial disasters still happen in India as well as in the rest of the industrialized part of the world. Although more recent events are far smaller than that of the event in Bhopal, they are so numerous that chemical hazards could easily be considered a public health problem. The companies involved usually dispute their own roll in the events, and often deny the health effects of the incident. The companies also have been reluctant to compensate the victims financially.

Methods: This report is based on a thorough review of material already published from India and its surroundings, as well as the author's experiences while visiting Bhopal. The Logical Framework Approach (LFA), a tool for project planning and management, was tested on this major event, in order to analyze its causes and consequences.

Results: The Logical Framework Approach (LFA) provided one main message: Irrespectively of the direct cause of the leakage, only two parties are responsible for the magnitude of the disaster: (1) the Union Carbide Corporation; and (2) the Governments of India and Madhya Pradesh. Models developed for analysis of injuries can be used for analyzing a complicated, major incident, such as the Bhopal gas leak, though different models might stress different aspects. Visualizing causes and consequences in tree models might provide a new understanding. When visualizing causes and consequences of this kind of event, it is obvious that "chain" and "tree" are not the right words—"net" is more appropriate. Analysis according to the LFA problem tree demonstrates that to create such a major gas leak, water entering the tank alone was not enough. The most important factors were the design of the plant and the recent cut in expenses because of economic pressure. The same analysis shows that the most important factor for the outcome of the leakage is the negligence of the Union Carbide Corporation and the Governments of India and Madhya Pradesh.

Conclusion: To reduce the influence of chemical industries on public health, there is a great need for actions from many areas. The governments have a responsibility to protect their inhabitants from the negative effects of "development". As a result of globalization, coordination between governments and national organizations is necessary.

Keywords: Bhopal; chemical; consequences; health effects; India; Logical Framework Approach (LFA); Union Carbide Corporation
Prehosp Disast Med 2005;20(2):s92

Nerve Agent Poisoning of Children: Medical and Operational Considerations for Emergency Medical Services (EMS) in a Large American City

A. Cooper;[1] G. Foltin;[2] M. Tunik;[2] J. Pyun;[2] L. Marshall;[3] J. Bove;[3] M. Guttenberg;[3] A. Cherson;[3] Y. Langsam;[3] B. Kaufman;[4] G. Asaeda;[4] D. Gonzalez;[4] J. Clair[4]
1. Columbia University/Harlem Hospital, New York, New York USA
2. New York University/Bellevue Hospital, New York, New York USA
3. Regional Emergency Medical Advisory Committee of New York City, Utica, New York USA
4. Fire Department, City of New York, New York, New York USA

Most published recommendations for the treatment of nerve agent poisoning of children rely on standard resuscitation doses of atropine. However, certain medical and operational concerns suggest an alternative approach may be warranted for treatment of children following nerve agent exposure by emergency medical services (EMS) personnel: (1) there is evidence that supra-pharmacologic doses may be needed and that side effects can be tolerated; and (2) there is concern that many EMS personnel will have difficulty determining the age of the child and the severity of the symptoms. Thus, the Fire Department of the City of New York (FDNY), the Regional Emergency Medical Advisory Committee (REMAC) of New York City, and the Center for Pediatric Emergency Medicine (CPEM) have developed a pediatric, nerve agent antidote-dosing schedule to address these concerns (Table 1).

These doses are similar to those being administered to adults with severe symptoms and within limits shown tolerable by accidental nerve agent overdose in children. The doses in Table 1 likely are a safe and effective alternative to weight-based doses, which nearly would be impossible to attain under field conditions.

Tag Color	Exposure/ Symptoms	Atropine/ 2-PAM	Dose/ Intervals
Red (Pediatric)	Yes (Age <1 year)	1 Pediatric Atropen No 2-PAM	0.5 mg q3m PRN
	Yes (Age 1–8 years)	1 Standard Atropen 1 2-PAM Autoinjector	2.0 mg q3m PRN 600 mg
Green (Pediatric)	No	None	Check q10m for symptoms/signs

Table 1—Dosing schedule for patients <9 years of age (m = minutes)

Keywords: atropine; children; dose; nerve agent; poisoning; treatment
Prehosp Disast Med 2005;20(2):s92