The Relevance of the Chemical Corps as a Deterrent

By Captain Lucas Hoffmann

It's no secret that many Soldiers from other branches—and even some fellow Dragon Soldiers—view the Chemical Corps as "irrelevant" and that resistance to chemical, biological, radiological, and nuclear (CBRN) training has been continually building. CBRN Soldiers are being tasked to serve in other areas, and their required training is being rescheduled to accommodate training in the tasks they will actually perform when deployed. These ideas and practices are based on the misconception that, if CBRN Soldiers aren't responding to chemical attacks, they are not performing their duty to protect Soldiers from chemical weapons. This is not true. CBRN Soldiers prevent attacks from occurring simply by being trained and equipped to deal with them. The greatest deterrent to the use of chemical weapons is a competent, effective CBRN defense program.

When making a decision about whether to invest in the development and use of chemical weapons, an enemy must perform a cost/benefit analysis. The potential benefits of chemical weapons can be analyzed by examining how they have historically been employed, determining the effects they have had, and extrapolating the results to the modern setting.

The first time that chemical weapons were employed on a large scale was during World War I, which served as an ideal setting for the employment of chemical weapons in warfare. Enemy troops were restricted to given locations and confined to trenches, where poisonous gases could settle and accumulate. Furthermore, the technology for protecting against chemicals was nonexistent at the outset of the war and later attempts at its advancement were hasty, resulting in the inability to keep up with the development of new chemicals. In addition, there was a general failure at all levels—from the troops on the ground to the commanders of the armies—to understand the concepts involved.

When gas was first employed as a weapon in 1915, there was no modern chemical equipment available in any form. The only means for the detection of chemical agents was the sense of smell—which posed a health risk to Soldiers attempting to detect chemical agents. Given the variety and intensity of odors on the battlefield, the sense of smell was also a very unreliable means of detection. Standard issue clothing provided the only skin protection, protective masks were not included in the military arsenal, and there was no formal decontamination procedure in place. Pieces of gauze soaked with sodium hypochlorite were used as makeshift "gas masks" in response to the first chemical attack. Soon thereafter, the British smoke hood, or "hypo helmet" (a cloth sack soaked in reactive chemicals), was issued. The hypo helmet was of poor quality, breaking easily and offering only limited protection. The British small box respirator and the French M2 gas mask were developed in 1916; and by 1917, had been issued to the troops of those countries. Although the British small box respirator was more effective, the French mask was more comfortable and could be worn for longer periods of time.

But training and discipline regarding chemical protection were severely lacking. Consequently, the few primitive methods of protection that were available were frequently misused, if they were used at all. Most troops did not understand the dangers posed by poison gas until they witnessed the results firsthand. Even Soldiers who recognized the need for face masks were often unaware of the proper donning procedures. One written account relates how a group of men, upon being informed that gas could affect their lungs, believed that they could protect themselves by wearing their masks over their chests.[1] Some Americans who were issued both the British small box respirator and the French M2 mask became exposed to poisonous gases when switching from one mask to the other upon the realization that they would need protection for an extended period of time.[2] In addition, officers often did not want troops who had been attacked with mustard gas to return to rear areas, where they would have had the opportunity to wash their skin and clothing. Thus, the effects suffered were far worse than necessary.

To determine the modern applicability of this historic scenario, we must first examine the reasons for the effectiveness of the chemical agents and then ascertain whether the same methods would be as effective if used today. Table 1, page 12, outlines the causes of gas casualties in a series of World War I battles. As indicated in the table, two of the most common causes of gas casualties were premature mask removal due to bad judgment and failure to detect the presence of the agent due to low concentrations or the use of chemicals in conjunction with conventional explosives. Similar, modern-day scenarios could be easily prevented through the use of standard chemical detectors such as the M22 Automatic Chemical Agent Detector and Alarm or M256 Chemical Agent Detector Kit. Another significant cause of World War I gas casualties was the requirement for troops to remain in a contaminated area. However, this problem has been addressed through the development of personal protective equipment. As evidenced by the data in Table 2, which depicts the efficacy of German chemical agents against British forces during different years of the war, the number of casualties per given amount of agent was at its highest in 1915—when gas was first used and there was no protective equipment in existence. But when masks began to be employed against the nonpersistent choking agents of 1916, only half the number of casualties were reported—despite the fact that more than twice as much agent was used. A later increase in agent effectiveness (from 1917 to 1918) was the result of mustard gases that could persist in areas for extended periods of time, causing casualties through exposed skin and rendering masks insufficient for protection. The importance of protective equipment can also be seen in the chemical weapon-related death rates of various countries (Table 3). The number and percent of fatalities suffered by the Russian army were significantly higher than those of other countries due to the lack of effective personal protective equipment provided to the Russian soldiers. Today, the problem of prolonged exposure to chemical agents is effectively overcome through the exchange of mission-oriented protective posture gear and the decontamination of equipment. Today's troops receive protective joint service, lightweight, integrated-suit technology clothing when in contaminated areas; and contamination is removed at the earliest opportunity.

Table 1. World War I Gas Casualities

Cause of Gas Casualty	Percentage of Total Casualties	Percentage for Entire Group
Failure to mask		27.2
Not detected because of high explosive	7.0	
Low concentrations	17.5	
Asleep	1.6	
Mask missing or defective	0.2	
In supposedly gas-proof shelter	0.9	
Slow masking		10.2
Surprised, high concentrations, panic, careless, concussions, wounded by shells	9.0	
Did something else first	0.1	
High breathing rate	1.1	
Mask overwhelmed	0.0	0.0
Removed mask prematurely		39.4
Bad judgment	26.2	
Exhaustion	6.2	
Torn off by shell or barbed wire	2.3	
Changed masks	0.1	
Removed for better performance of duties	4.6	
Contact with agent		23.2
Liquid mustard splash	0.8	
Stayed in contaminated area	18.4	
Passed through contaminated area	4.0	
Note. There was only one case in which a mask was overwhelmed in the battles recorded.		

Source: Clark, 1959.[3]

But for all of the attention that chemical weapons garnered during World War I, they actually accounted for only 1.24 million of the 37 million war casualties (or about 3 percent). The effect of chemical weapons on a trained and prepared adversary is, as expected, significantly less than that experienced by an enemy lacking in training and equipment.

Another historic—but more modern—example of the use of chemical weapons occurred in 1988, when the Iraqi government used a mixture of mustard gas, sarin, and VX to exterminate the unprepared Kurdish population in the civilian city of Halabja. The attack resulted in 7,000 to 10,000 casualties, with a death rate near 40 percent. These figures highlight two important concerns: an increase in the lethality of modern nerve agents and the vulnerability of a population with no chemical protection or training.

The development of chemical weapons is very costly. In addition to the money needed to purchase sufficient stock materials and acquire the services of appropriately trained personnel, the building of a chemical weapons program renders the adversary vulnerable. While the Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on Their Destruction (commonly known as the Chemical Weapons Convention [CWC]) describes some specific "smoking gun" precursors to chemical weapons, most components that are used to manufacture chemical weapons are considered hazardous materials and are, therefore, assigned a unique identifier that is filed with international shipping companies. These chemicals must be shipped to specific physical locations and can be tracked. The association of production to a specific location is dangerous for a state actor, given the potential of an air strike or guided-missile attack.

If the manufacture of chemical agents is expensive for a state actor, it is more so for nonstate actors. While nonstate actors generally do not face the same retaliation threats that confront nations, the impunity is largely due to the difficulty in pinpointing the location of the nonstate actor, the lack of a requirement for the nonstate actor to protect any single asset, and the ability of nonstate actors to operate by using relatively unskilled individuals.

Another advantage that nations have over terrorists when it comes to chemical weapon production is the ability to experiment and rehearse. A few terrorists, including Ramzi Yousef (one of the perpetrators of the 1993 World Trade Center bombing), Muharem Kurbegovic (the Alphabet Bomber, who bombed several locations in Los Angeles, California), and members of Aum Shinrikyo (the Japanese religious group responsible for carrying out sarin attacks in Tokyo in 1995), have attempted to use chemical agents. All failed to achieve the massive number of casualties they sought. Of particular interest is the Aum Shinrikyo case. Since that organization boasts competent scientists and a large bankroll, it seems that their success would have been plausible. However, only 20 civilians were killed in 10 chemical attacks,[7] despite the fact that one of the attacks took place in a crowded subway.

At the present time, we seem to be better at defending ourselves against a chemical attack than terrorists seem to be at deploying these attacks. But maintaining a trained and active Chemical Corps is essential to ensuring that this remains the case.

Table 2. Efficacy of German Chemical Agents Against British Forces

Year	Percentage of German Agent Used	Percentage of British Gas Casualties	Efficacy (Percent)
1915	5.5	6.9	125
1916	13.3	3.6	27
1917	28.2	28.2	100
1918	53.0	61.3	116

Source: Clark, 1959.[4]

Table 3. Chemical Weapon-Related Casualties of Various Countries During World War I

Country	Casualties	Deaths	Percent
Austria-Hungary	100,000	3,000	3.0
British Empire	188,706	8,109	4.3
France	190,000	8,000	4.2
Germany	200,000	9,000	4.5
Italy	60,000	4,627	7.7
Russia	419,340	56,000	13.4
USA	72,807	1,462	2.0
Others	10,000	1,000	10.0

Sources: Clark, 1959[5] and Duffy, 2009.[6]

Although this article exclusively addresses the *chemical* weapons that are the namesake of our branch, the message remains the same when considering biological or radiological warfare—without a trained, competent, and prepared response, the consequences of an attack would be severe. This is not an idle threat. Against protests from the global community, Iran and North Korea are pursuing nuclear technology. Both countries have the technical proficiency and financial resources to begin such a program, and international disapproval and sanctions are not effective deterrents.

The best way to reduce the risk of a CBRN attack is by demonstrating that there is an effective mitigation strategy in place. It is essential that all Soldiers not only understand the potential severity of a CBRN attack, but also that they know what they can do to protect themselves and what the Army is doing to protect them.

Endnotes:

[1]Dorothy Kneeland Clark, Staff Paper ORO-SP-88, "Effectiveness of Chemical Weapons in WWI," Operations Research Office, Tactics Division, Johns Hopkins University, November 1959, p. 46.

[2]Ibid, p. 131.

[3]Ibid, p. 130.

[4]Ibid, p. 102.

[5]Ibid, p. 99.

[6]Michael Duffy, "Weapons of War—Poison Gas," *First World War: A Multimedia History of World War One*, 22 August 2009, <*http://www.firstworldwar.com/weaponry/gas.htm*>, accessed on 14 March 2011.

[7]Jonathan B. Tucker, editor, *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, MIT Press, Cambridge, Massachusetts, 2000.

References:

Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on Their Destruction (Chemical Weapons Convention), 3 September 1992.

Ian Bellany, editor, *Terrorism and Weapons of Mass Destruction: Responding to the Challenge*, Routledge, London, England, 2007.

Tushar K. Ghosh, et al., editors, *Science and Technology of Terrorism and Counterterrorism*, Vol. 101, Taylor & Francis, Inc., August 2002.

S. J. Lundin, editor, *Non-Production by Industry of Chemical-Warfare Agents: Technical Verification Under a Chemical Weapons Convention*, Stockholm International Peace Research Institute, 1988.

S. J. Lundin, editor, *Verification of Dual-Use Chemicals Under the Chemical Weapons Convention: The Case of Thiodiglycol*, Oxford University Press, 1991.

"Thousands Die in Halabja Gas Attack," *BBC News: On This Day (16 March)*, <*http://news.bbc.co.uk/onthisday/hi/dates/stories/march/16/newsid_4304000/4304853.stm*>, accessed on 16 March 2011.

At the time this article was written, Captain Hoffmann was a student in the CBRN Captain's Career Course at Fort Leonard Wood, Missouri. He holds bachelor's degrees in biomedical engineering and chemistry from St. Louis University.