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Chemical Warfare: An Unprecedented Environmental Threat

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Abstract. The Syrian war has left an unforgettable scar on mankind. What started as a revolution to overthrow a despotic regime has now taken the form of an inhumane civil strife. In an unprecedented use of chemical weapons, 'Sarin gas,' 'Mustard gas' and others were weapons that every innocent by stander were victims to.. Other than the failure on the part of the government, a very pressing concern that this paper highlights is the use of these deadly agents on man and environment and thus springboards to a much more contemporary universal issue of chemical weapons itself. Moreover, a recent development in Syria is that The United States of America has stepped in to neutralize the threat by destroying the existing stock of chemical munitions at sea which further brings up an array of environmental issues. Thus, other than the universal and contemporary issues of chemical weapons such as the use and effects of Sarin and Mustard gas, the consequences of destroying the existing stock of chemical munitions at sea have also been looked into while considering the United States past in chemical weapons destruction. After the use of chemical weapons on innocents and mass atrocities of human rights did it become the prerogative of the international community to step in and look into the matter because chemical warfare is a threat not limited to one state, but extends to the whole of the international community due to its impact on the environment.

Keywords: chemical warfare, Air pollution, nerve gas, environmental impacts of chemical weapons, health and environment, syria, toxicity assessment.

1. Introduction

"Reports of a chemical attack in a Damascus suburb, marked a turning point in the attitude of the United States and its allies toward the Syrian government. Disparate rebel groups have been fighting to overthrow President Bashar al-Assad's regime since 2011." [1] In the morning of 21st August 2013, Ghouta faced a chemical weapons attack where surface to surface rocket system of approximately 330m in diameter, Syrian produced and a Soviet era 140mm surface to surface rocket system were used to deliver a nerve agent. The first warhead, the 330mm was designed to be loaded with and deliver a large payload of liquid chemical agent. The second type has the ability to be armed with three possible warheads, one such warhead that was specifically designed to carry and deliver 2.2 kilograms of Sarin. The attack took place as part of heavy government bombardment of the region surrounding Damascus, where government forces had been trying to drive out rebel forces.

1.1. Effect of nerve gases

Toxicity of nerve gases depends on the route of exposure. Relevant routes of exposure for chemical weapon agent breakdown are oral, inhalation and dermal. Sarin, one of the most dangerous nerve gas, is an extremely potent toxin capable of attacking the nervous system and causing death. The fact that it is solvent poses an even larger threat to mankind and the environment. Sarin is known to cause death in freshwater fishes which still have adequate amounts to pose a threat to persons upon consumption.[2] Experiments of fish exposed to Sarin have provided a method of detection of tracing chemical warfare agent in water and help in studying concentration- time relationships.

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In event of chemical warfare, nerve gases have very high potency to contaminate water as small quantities can produce toxic symptoms from ingestion. The liquid can be absorbed through intact skin and also through the gut after ingestion of contaminated food. Considerable attention must be placed on Sarin as it is not detected easily.

Severe intoxication is manifested by salivation, involuntary defecation and urination, sweating, lacrimation, bradycardia and hypotension, respiratory depression, collapse, convulsions, and death. The proximal cause of death is respiratory failure. Vapor inhalation with concomitant ocular vapor exposure is the most effective and most likely route of administration, especially for the more volatile agents.

Sarin affects animals as a neurotoxin. Neurotoxicity, as manifested by ataxia (rat, cow), decreased activity (rat, mouse), prostration (rat, mouse, cow, mink), salivation (mink, duck), and depression and engorgement of meningeal vessels along with excess fluid in cerebral ventricles (cow), is the predominant result of acute exposure to doses in the moderate-to-lethal range. [3] Either of two stabilizers are added to Sarin, diisopropylcarbodiimide or tributylamine. The former was also used with VX. Tributylamine causes eye, skin, and respiratory irritation in humans as well as CNS stimulation and skin sensitization. Degradation products associated with decontamination of tributylamine differ depending on the decontaminant used.

Mustard Gas further results in 95% respiratory involvement. One -time exposure to a relatively high concentration of mustard could result in chronic or recurring effects. Respiratory problems were most frequently observed. However, skin and eye lesions that had apparently healed recurred spontaneously decades later to World War victims. In addition, soldiers who had been gassed with mustard seemed to develop respiratory cancers more frequently than expected.

If Mustard gas spilled into seawater, it would sink and remain on the bottom, where it would slowly dissolve, resulting in no more than a few parts per million of unhydrolyzed mustard in the supernatant water and because of the low water solubility of Mustard gas and formation of intermediate products, bulk amounts of Mustard gas may be persistent, undispersed under water for some time.

Mustard gas is considered fairly persistent in the environment. Mustard gas is extremely toxic to all species, but its environmental action is limited by its low solubility. Fish are the most sensitive species. Large quantities of Mustard gas would persist underwater for considerable periods and retain blister-forming properties.

2. Environmental Concerns and Provisions

Handling and transporting munitions and containers from the storage area to the destruction facility has to be conducted in compliance with the strictest safety measures to prevent any accidental release of chemical agents, which could endanger either the personnel, the civilian population or the environment.

There is growing public concern on this issue regarding both the risk involved in a direct exposure, as well as the long term low level exposure to agents, disposal, and degradation products. Protection of human health and preservation of the environment is one of the primary duties for all States Parties. Under the provisions of the CWC [4] too, (Chemical Weapons Convention), their duty is cited over and again in various Articles. Secretary-General condemned the use of chemical weapons and believes that this act is a war crime and grave violation of the 1925 Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare and other relevant rules of customary international law.[5]

Since 14th September 2013, Syria is a member state to the OPCW (Organization for the Prohibition of Chemical Weapons). On the recent chemical attacks in Damascus the OPCW has held and directed, [6] the Syrian Arab Republic to establish a timeline for the destruction of unfilled munitions in its territory, mustard gas and other chemical weapons in its territory and containers previously containing chemical agents. The report also contained results from various tests conducted on fabric, linen, rubble and parts of metal which showed positive signs for Sarin. Other chemicals such as Ethyl isopropyl, methylphosphonate, isopropyl propyl, diisopropyl, dimethylpyrophosphonate, Hexamethylenetetramine which are by-products (decomposed) of Sarin were found.

2.1. The faulty syrian plan

The mature large-scale CW destruction technologies are divided in two main groups: high temperature destruction technologies like incineration and low-temperature destruction technologies like hydrolysis followed by post-treatment of the generated reaction masses. Until 1972, the primary disposal method for chemical weapons was ocean dumping. In a 2001 Army report, samples include more than 60,000 gallons of arsenic trichloride and 75,000 mustard shells were dumped into the Atlantic by the Navy in 1945; between 1946 and 1997, Italian scientists documented 232 mustard-related injuries — including five deaths after chemical materials were ensnared in fishing nets or disturbed by dredging operations. [7] The notion that the vastness of the ocean is sufficient to dilute discarded weapons is gravely mistaken.

Syrian President Bashar al-Assad's government agreed to destroy its chemical weapons arsenal after the August 21 Ghouta attack, which had led to threats of U.S. air strikes. Syria also acceded to the Chemical Weapons Convention.

The US taking the step forward in destroying Syria's chemical weapons at sea with the newly developed Field Deployable Hydrolysis System, designed by the Defense Department to neutralize chemical weapon components. A ship, MV Cape Ray will be equipped with it and seeks to carry out the work at a Mediterranean Port.Now, China is said to send a ship to participate alongside the U.S in destroying the chemical weapons at sea.

Chemical weapons disposal decisions are on tricky moral ground. To forgo military intervention is to abandon the Syrian people at the moment of their greatest vulnerability. Inaction would send a message to the world — that geopolitics and tactical uncertainty continue to trump the defense of basic human rights and the prevention of crimes against humanity however to pursue the destruction of Syria's chemical weapons is to ignore history's lessons; current options of weapons disposal have proved ineffective, even counterproductive. [8] Removing these weapons does not justify the poisoning of our oceans and air; it needs to be done in a socially and ecologically conscious way.

As of now, the United States has just two publicly known, methods for disposing of chemical and biological weapons. The first relies on either incineration or chemical neutralization. The second involves "thermally treating" a liquid agent at a 10- or 20-to-1 ratio of C4 plastic explosive to agent or otherwise known as blasting it out. A third option, which involves mixing the chemical precursors for nerve agents with massive amounts of lye and water, is considered even more risky than the first two. [9]

The disposal of chemical weapons, like many environmental problems are very complicated. The one issue that is not debatable is that of toxicity, these are chemical weapons and were designed to kill quickly and efficiently, therefore any disposal system must destroy completely and 100% of the time. When done poorly, this could lead to drastic results and thus any factory in Syria built to demilitarize chemicals agents could cause gross contamination of groundwater and soil, which hazardous to the local population. Similarly, disposal by detonation would contaminate the immediate area and require extensive remediation or long-term quarantine. [10]

"We do not inherit the earth from our ancestors; we borrow it from our children." [11]

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