DOWNLOAD PDF CHARACTERISTICS OF CHEMICAL WEAPONS

Chapter 1 : Chemical weapon | theinnatdunvilla.com

Chemical Weapons: A Summary Report of Characteristics and Effects Congressional Research Service Summary The potential for terrorist use of chemical agents is a noted concern highlighted by the Tokyo.

Messenger Chemical weapons, lethal poison that can be disseminated as gases, aerosols or liquids, are commonly included in the classification of weapons of mass destruction. Like nuclear and biological weapons, the impact of chemical weapons can widen indiscriminately and uncontrollably, making entire troops or civilians vulnerable to them. The characteristics of these poisons also make them weapons of terror. They do not only injure the body. The threat of chemical weapons harms the minds of soldiers and civilians. Features of chemical agents There are four types of chemical agents: Choking agents, such as chlorine and phosgene gas, damage the lungs and fill them with fluid. Blood agents, such as hydrogen cyanide and cyanogens chloride gas, are potent and fast-acting poisons. They prevent cells from utilising oxygen, which stops vital organs from working properly. They can also attack enzymes, preventing the synthesis of molecules used as a source of energy by the body, causing vomiting, dizziness, unconsciousness and death. Blister agents, such as sulfur mustard known as mustard gas and lewisite gas, burn and damage the skin, the inside of the lungs and other tissues of the body. Nerve agents, divided into two groups: V-series agents and G-series agents. VX, the most infamous V-series agent, is the most lethal poison that enters the body through contact with the skin. Unfortunately, detailed information about their characteristics is not widely available in the open literature. Meanwhile, G-series agents, first discovered by German scientists, such as soman GD , sarin GB and tabun GA gases, mostly cause death through inhalation. Both groups of nerve agents disable vital enzymes in the nervous system, resulting in loss of voluntary control, seizures and death by respiratory paralysis. Even in low concentration, they could injure soldiers or civilians by causing shortness of breath and visual impairment. Malaysian authorities reported that he was poisoned with the nerve agent. The Red Cross also recently announced that civilians in Mosul, Iraq, have been exposed to blister agents amid fighting between Islamic State fighters and US-backed Iraqi forces. Most of these four types of agents are invisible, tasteless, odourless, silent and insidious. Nonetheless, some chemical agents have typical odours, which soldiers and civilians could be trained to recognise. Mustard gas smells like garlic, hydrogen cyanide like bitter almonds, phosgene like new-mown hay, and lewisite like geraniums. Impacts of chemical weapons Chemical weapons, especially in the form of gas, seem the most frightening for soldiers and civilians, because there is yet to be a way to fight back chemical clouds. In March , a sarin attack carried out on the Tokyo Subway by the Aum Shinrikyo cult killed 12 people, injured more than 1, and more than 5, people that sought treatment. The Geneva Protocol, which was signed in , prohibits the use of chemical weapons, but these weapons have been used in wars since. Soldiers could only wait for the gas or clouds to move away from them when exposed to chemical clouds and hope that their gas masks and respirators worked properly. Additionally, when soldiers are unable to avoid the anxious situation, they can become nervous, panicked, irrational and depersonalised, or experience changes in self-awareness and are likely to feel detached from themselves. For instance, they can take off their gas masks or run without regard for anything. Soldiers can feel a heightened sense of stress and fear of chemical threats when seeing artillery, aircraft, ballistic missiles or other weapons systems that can be used to deliver chemical agents. Soldiers can also wrongly suspect that common bodily symptoms of stress, anxiety and minor infectious diseases â€” such as runny nose, skin rashes, blisters, eye irritation, shortness of breath and diarrhoea â€” are early symptoms of exposure to chemical agents. Defence against chemical weapons International export controls regulate the selling of equipment used for for large-scale production of chemical weapons. This makes it rather difficult to acquire materials to produce such weapons. Most chemical agents do not occur in nature. Most chemical agents require artificial synthesis and manufacture, and many require a dedicated effort to acquire in bulk. However, the technology to manufacture most chemical agents is widely published in open literature. The equipment to create small-scale chemical weapons can be bought from chemical distributors. In warfare, such as in the Gulf War, US troops protect themselves against chemical weapons with gear such as gas masks, helmet covers, rubber gloves, battledress over-garment BDO , hoods and over-boots. The BDO is a suit coat and trousers made of an inner layer of charcoal-impregnated polyurethane foam, which absorbs and traps chemical agents, and an outer layer of cotton with camouflage markings. Despite its good protection, wearing BDOs for more than a short time weakens fighting capability considerably. A US soldier wearing protective gear in an undisclosed location in the Kuwaiti desert, taken on March 20, For some soldiers, gas masks can cause severe claustrophobia extreme fear of confined places. Although the gas masks with respirators protected the respiratory tract and eyes of the troops against chemical attacks, mustard gas was still able to burn and blister even through clothing. This was impractical since the quantity of bleaching powder did not match the requirements. The boxes of bleaching powder also created an extra burden for the troops to carry. The US mobile bathing units to decontaminate its soldiers also seemed inefficient because the units were low in quantity, yet very heavy. Another defence effort against chemical attacks was a portable battlefield detection system. Because many chemical agents are odourless, troops needed an automatic detector and alarm system to give them advance warning so that they can put on their gas masks in time. Nevertheless, the detector had several major weaknesses. It did not work at temperatures below freezing, it could run out of battery, and it needed frequent maintenance. In conclusion, since they had no decisive impact on the outcome of wars, yet had a powerful psychological impact on soldiers and civilians, chemical weapons are more weapons of terror than weapons of mass destruction.

Chapter 2 : Chemical and Biological Weapons: Use in Warfare, Impact on Society and Environment

Like nuclear weapons and biological weapons, chemical weapons are often classified as weapons of mass theinnatdunvilla.com the Chemical Weapons Convention (CWC) of , the use of chemical weapons in war is prohibited, as is all development, production, acquisition, stockpiling, and transfer of such weapons.

Essentially all transuranic materials in existence are manmade. The atomic number of plutonium is Plutonium has 15 isotopes with mass numbers ranging from to Isotopes of the same element have the same number of protons in their nuclei but differ by the number of neutrons. Since the chemical characteristics of an element are governed by the number of protons in the nucleus, which equals the number of electrons when the atom is electrically neutral the usual elemental form at room temperature , all isotopes have nearly the same chemical characteristics. This means that in most cases it is very difficult to separate isotopes from each other by chemical techniques. Only two plutonium isotopes have commercial and military applications. Plutonium, which is made in nuclear reactors from neptunium, is used to make compact thermoelectric generators; plutonium is used for nuclear weapons and for energy; plutonium, although fissile, see next paragraph is impractical both as a nuclear fuel and a material for nuclear warheads. Some of the reasons are far higher cost , shorter half-life, and higher radioactivity than plutonium Isotopes of plutonium with mass numbers through are made along with plutonium in nuclear reactors, but they are contaminants with no commercial applications. In this fact sheet we focus on civilian and military plutonium which are interchangeable in practiceâ€”see Table 5 , which consist mainly of plutonium mixed with varying amounts of other isotopes, notably plutonium, , and Plutonium and plutonium are fissile materials. This means that they can be split by both slow ideally zero-energy and fast neutrons into two new nuclei with the concomitant release of energy and more neutrons. Each fission of plutonium resulting from a slow neutron absorption results in the production of a little more than two neutrons on the average. If at least one of these neutrons, on average, splits another plutonium nucleus, a sustained chain reaction is achieved. The even isotopes, plutonium, , and are not fissile but yet are fissionableâ€”that is, they can only be split by high energy neutrons. Generally, fissionable but non-fissile isotopes cannot sustain chain reactions; plutonium is an exception to that rule. The minimum amount of material necessary to sustain a chain reaction is called the critical mass. A supercritical mass is bigger than a critical mass, and is capable of achieving a growing chain reaction where the amount of energy released increases with time. The amount of material necessary to achieve a critical mass depends on the geometry and the density of the material, among other factors. The critical mass of a bare sphere of plutonium metal is about 10 kilograms. It can be considerably lowered in various ways. The amount of plutonium used in fission weapons is in the 3 to 5 kilograms range. According to a recent Natural Resources Defense Council report 1 , nuclear weapons with a destructive power of 1 kiloton can be built with as little as 1 kilogram of weapon grade plutonium 2. The smallest theoretical critical mass of plutonium is only a few hundred grams. In contrast to nuclear weapons, nuclear reactors are designed to release energy in a sustained fashion over a long period of time. This means that the chain reaction must be controlledâ€”that is, the number of neutrons produced needs to equal the number of neutrons absorbed. This balance is achieved by ensuring that each fission produces exactly one other fission. All isotopes of plutonium are radioactive, but they have widely varying half-lives. The half-life is the time it takes for half the atoms of an element to decay. For instance, plutonium has a half-life of 24, years while plutonium has a half-life of The various isotopes also have different principal decay modes. The isotopes present in commercial or military plutonium are plutonium, , and Table 2 shows a summary of the radiological properties of five plutonium isotopes. The isotopes of plutonium that are relevant to the nuclear and commercial industries decay by the emission of alpha particles, beta particles, or spontaneous fission. Gamma radiation, which is penetrating electromagnetic radiation, is often associated with alpha and beta decays.

Chapter 3 : Explainer: what are chemical weapons and how do soldiers guard against them?

Properties of chemical weapons Chemical weapons can be categorized by their physical characteristics, such as lethality, persistency, mode of action on the human body, and physical state (i.e., gas, liquid, or solid) when being delivered.

See Article History Chemical weapon, any of several chemical compounds , usually toxic agents, that are intended to kill, injure, or incapacitate enemy personnel. In modern warfare, chemical weapons were first used in World War I â€”18 , during which gas warfare inflicted more than one million of the casualties suffered by combatants in that conflict and killed an estimated 90, In the years since then, chemical arms have been employed numerous times, most notably in the Iran-Iraq War â€” The United States and the Soviet Union , during their decades of confrontation in the Cold War â€”91 , built up enormous stockpiles of chemical weapons. The end of the Cold War enabled those former adversaries to agree to ban all chemical weapons of the types that had been developed during World War I first generation , World War II second generation , and the Cold War third generation. Under the Chemical Weapons Convention CWC of , the use of chemical weapons in war is prohibited, as is all development, production, acquisition, stockpiling, and transfer of such weapons. Nevertheless, while the aim of the CWC is complete elimination of most types of chemical weapons, not all countries have abandoned their chemical warfare capabilities. In particular, some weaker states have pursued chemical weapons programs as deterrents to being attacked by enemies that have either stronger conventional forces or their own weapons of mass destruction, and some regimes have used chemical weapons to threaten especially vulnerable foes outside and even within their own borders. Furthermore, some individuals and militant organizations have acquired or have sought to acquire chemical weapons in order to attack their enemies or to secure their own ends through terror. The continued threat from chemical weapons has led many states to prepare defenses against them and to exert diplomatic pressure on dissenting or noncompliant states to abide by the CWC. Types of chemical weapons Chemical weapons are chemical agents, whether gaseous, liquid, or solid, that are employed because of their direct toxic effects on humans, animals, and plants. They inflict damage when inhaled, absorbed through the skin, or ingested in food or drink. Chemical agents become weapons when they are placed into artillery shells, land mines, aerial bombs, missile warheads, mortar shells, grenades, spray tanks, or any other means of delivering the agents to designated targets. Not all poisonous substances are considered suitable for weaponization, or use as chemical weapons. Thousands of such chemical compounds exist, but only a few dozen have been used as chemical warfare agents since The compounds of most utility must be highly toxic but not too difficult to handle. Furthermore, the chemical must be able to withstand the heat developed when delivered in a bursting shell, bomb , mine, or warhead. Finally, it must be resistant to water and oxygen in the atmosphere in order to be effective when dispersed. Chemical agents Since World War I, several types of chemical agents have been developed into weapons. These include choking agents, blister agents, blood agents, nerve agents, incapacitants, riot-control agents, and herbicides. The first massive use of chemical weapons in that conflict came when the Germans released chlorine gas from thousands of cylinders along a 6-km 4-mile front at Ypres , Belgium, on April 22, , creating a wind-borne chemical cloud that opened a major breach in the lines of the unprepared French and Algerian units. The Germans were not prepared to exploit the opening, which gave the French and Algerians time to rush reinforcements into the line. Eventually both sides mastered the new techniques of using choking agents such as chlorine, phosgene , diphosgene , chloropicrin , ethyldichlorasine, and perfluoroisoboxylene and launched numerous attacksâ€”though without any militarily significant breakthroughs once each side had introduced the first crude gas masks and other protective measures. Phosgene was responsible for roughly 80 percent of all deaths caused by chemical arms in World War I. Choking agents are delivered as gas clouds to the target area, where individuals become casualties through inhalation of the vapour. The toxic agent triggers the immune system , causing fluids to build up in the lungs, which can cause death through asphyxiation or oxygen deficiency if the lungs are badly damaged. The effect of the chemical agent, once an individual is exposed to the vapour, may be immediate or can take up to three hours. A good protective gas mask is the best defense against choking agents. Blister agents Blister agents were also developed and deployed in World War I. The primary form of blister agent used in that conflict was sulfur mustard, popularly known as mustard gas. Casualties were inflicted when personnel were attacked and exposed to blister agents like sulfur mustard or lewisite. Delivered in liquid or vapour form, such weapons burn the skin, eyes, windpipe, and lungs. The physical results, depending on level of exposure, might be immediate or might appear after several hours. Although lethal in high concentrations, blister agents seldom kill. Modern blister agents include sulfur mustard, nitrogen mustard, phosgene oxime, phenyldichlorarsine, and lewisite. Protection against blister agents requires an effective gas mask and protective overgarments. Blood agents Blood agents, such as hydrogen cyanide or cyanogen chloride, are designed to be delivered to the targeted area in the form of a vapour. When inhaled, these agents prevent the transfer of oxygen to the cells, causing the body to asphyxiate. Such chemicals block the enzyme that is necessary for aerobic metabolism, thereby denying oxygen to the red blood cells, which has an immediate effect similar to that of carbon monoxide. The best defense against blood agents is an effective gas mask. Page 1 of 6.

Chapter 4 : Chemical warfare agents

Often referred to as the " poor man's bomb," chemical weapons require a relatively low investment, can cause severe psychological and physical effects and are agents of disruption.

Nerve agents The most lethal and important chemical weapons contain nerve agents, which affect the transmission of impulses through the nervous system. A single drop on the skin or inhaled into the lungs can cause the brain centres controlling respiration to shut down and muscles, including the heart and diaphragm , to become paralyzed. Poisoning by nerve agents causes intense sweating, filling of the bronchial passages with mucus, dimming of vision , uncontrollable vomiting and defecation , convulsions , and finally paralysis and respiratory failure. Death results from asphyxia, generally within a few minutes of respiratory exposure or within hours if exposure was through a liquid nerve agent on the skin. Defense against nerve agents requires a skintight gas mask and special protective overgarments. In the mids chemists working for the German chemical corporation IG Farben developed the first organophosphorus compound with an extremely high toxicity; this became the nerve agent known as tabun GA. As much as 12, tons was produced for the German army in World War II , although it was never used. Another nerve agent, sarin GB , was first produced in , and a third, soman GD , was introduced in ; both were also invented in Germany. These three German nerve agents, the G-series for German in U. After the war the United States , the Soviet Union , and a number of other states also produced these and other nerve agents as weapons. VX , the most famous of the so-called V-series of persistent nerve agents and also the deadliest known nerve agent; V is for venom , was developed by chemists at a British government facility in Britain renounced all chemical and biological weapons in but traded information on the production of VX with the United States in exchange for technical information on the production of thermonuclear bombs. In the United States began large-scale production of VX. Following the signing of the CWC in , the United States and Russia began the elimination of their chemical weapons stocks, with a goal of finishing the process by ; neither country trains its forces with such weapons at present. Defense against nerve agents requires a skintight mask and effective protective overgarments. Incapacitants A good deal of work has been done on chemicals that can incapacitate, disorient, or paralyze opponents. Experiments have been conducted on a number of hallucinogenic drug compoundsâ€”for instance, 3-quinuclidinyl benzilate BZ , LSD lysergic acid diethylamide , mescaline , and methaqualoneâ€”and at one time the U. Army fielded BZ weapons. Those chemical weapons are designed not to kill; however, even incapacitants can cause permanent injury or loss of life if employed in high dosages or if they cause accidents. Other incapacitants might cause victims to sleep or to be slow to respond. Riot-control agents Tear gas and vomiting agents have been produced to control riots and unruly crowds. CN, the principal component of the aerosol agent Mace, affects chiefly the eyes. PS and CS are stronger irritants that can burn the skin, eyes, and respiratory tract. Although the United States signed and ratified the CWC, it has reserved the right to use riot-control agents in certain other situations, including counterterrorist and hostage-rescue operations, noncombatant rescue operations outside war zones, peacekeeping operations where the receiving state has authorized the use of force, and military operations against non-state actors initiating armed conflict. States can attach reservations if they do not directly undermine the essential purposes of the treaty. In this case it is less essential to regulate nonlethal herbicides than the more dangerous chemical weapons. Herbicides can be used to destroy enemy crops and foliage cover. For example, Agent Orange was used extensively by U. Other herbicides, such as paraquat, Agent White picloram and 2,4-D , and Agent Blue dimethyl arsenic acid , have also been produced to act as chemical weapons. Properties of chemical weapons Chemical weapons can be categorized by their physical characteristics, such as lethality, persistency, mode of action on the human body , and physical state i. Some chemical agents are highly lethal. For example, nerve agents such as sarin, tabun, soman, and VX can kill almost instantly; a few droplets absorbed through the skin can paralyze and cause death in minutes. At the other end of the lethality spectrum are chemical agents such as tear gas that only act as irritants or incapacitants and are unlikely to kill unless used in very large quantities. Chemical agents also have varied levels of persistency. Some evaporate in minutes or hours and lose their effect rapidly. For example, sarin is a lethal but nonpersistent nerve agent. By contrast, VX can persist for days or weeks in lethal form. This difference in persistency may lead to a different strategic or tactical use of each agent in wartime. A military force may use persistent chemical weapons, such as VX or mustard, to neutralize an air base, seaport, or key staging area for an extended period in order to deny its use to the adversary. On the other hand, nonpersistent chemical weapons, such as sarin, more likely would be employed where only a temporary effect is sought. On the other hand, nerve agent droplets might enter through the skin into the bloodstream and nervous system. Still other chemicals can be mixed with food in order to poison enemy personnel when they take their meals. Finally, chemical weapons might be delivered via aerosols, mortars, artillery shells, missile warheads, mines, or aerial bombs. Most of these have all the ingredients premixed, but newer chemical arms may be so-called binary weapons in which the ingredients are mixed in flight while the weapon is being delivered. Binary weapons are safer and easier to store and handle than more-traditional chemical arms.

Chapter 5 : Expect more chemical weapons attacks on Britain's streets, warns security minister

A Chemical Weapon is a chemical used to cause intentional death or harm through its toxic properties. Munitions, devices and other equipment specifically designed to weaponise toxic chemicals also fall under the definition of chemical weapons.

Due to the complexity of the toxic items, a qualitative comparison of present and future dangers for mankind and environment by taking only the quantitative aspects into consideration can and should not be made since it may lead to wrong conclusions. Non-lethal chemical weapons All weapons are made out of chemical elements, be it the metal shell of a grenade, sometimes made of depleted uranium, the explosive agent to propel it or the material filled into its encasing. The dangers of highly toxic, volatile rocket fuel on the delivery systems of nuclear warheads in Russia may be very high [26]. For this simple reason alone it is difficult to come up with an all-encompassing definition for chemical weapons. Are chemicals still material of weapons if they are used in very low concentrations? The latter point may be illustrated by the double use of Zyklon B or Cyclon B in English , that is used as fumigant for the purpose of pest and vermin control. It had been applied in low concentration in a beneficial way in the Nazi concentration camp of Dachau, while utilized in high concentration in the gas chambers of Auschwitz, it lead to one of the most criminal acts committed in the twentieth century [27]. They include infrasound, supercaustics, irritants like tear gas, and all those that could be aimed at non-human targets â€" such as combustion inhibitors, chemicals that can immobilize machinery or destroy airplane tires. The text of the CWC does not give always an unambiguous answer or definition what is a chemical weapon agent. It could be asked if the following agents fall into the category of chemical weapons, some of them old as war [10], like i Military Smoke Agents, ii Incendiaries producing fires and burns of skin? A special case takes v Depleted Uranium Ammunition, which can be considered a biological or a radiological weapon. Among those was the elimination of laser weapons, which are now banned by the Protocol IV, which was adopted by the Conference of the States Parties to the Convention and entered into force on 30 July [28, 29]. Other weapons are being negotiated, like submunitions in the form of bomblets assembled in clusters and delivered by aircraft or by artillery, rockets or guided missiles, be equipped with devices making them harmless if they fail to explode. One canister may contain 50 bomblets, or , or even as many as 4,, depending on the model, and may cover a ground area from to meters in diameter. The bomblets, when fitted with delayed action fuses, are effective area-denial weapons. Depleted Uranium DU [31], which draw a lot of public attention in the recent decade, is a by-product of enriching natural uranium â€" increasing the proportion of the U atom which is the only form of uranium that can sustain a nuclear reaction and is used in nuclear reactors or nuclear weapons. The remaining depleted uranium has practically no commercial value. The Department of Energy in the US DoE has a ,metric-ton stockpile, with very limited civilian use as a coloring matter in pottery or as a steel-alloying constituent [32]. Depleted uranium is chemically toxic like other heavy metals such as lead, but can produce adversary health effects being an alpha particle emitter with radioactive half-life of 4. Kinetic energy penetrators do not explode; they fragment and burn through armour due to the pyrophoric nature of uranium metal and the extreme flash temperatures generated on impact. They contaminate areas with extremely fine radioactive and toxic dust. This in turn can cause kidney damage, cancers in the lung and bone, non-malignant respiratory decease, skin disorders, neurocognitive disorders, chromosomal damage, and birth defects [33]. Depleted uranium weapons are proliferating and are likely to become commonly used in land warfare. Many NATO countries may follow suite. These weapons were used in large quantities first in the Gulf War [33, 34], and then again during the Kosovo War in [35]. The question can be asked if DU is mainly a chemical, or a radiological weapon? An immediate answer is not to be expected before classified material becomes available, and the medical reason for the Golf-War Syndrome is identified, which shows up in thousands of American soldiers. It appears that effect of the radioactive by inhalation of small doses will have only a small impact on risk to die of cancer, whereas the heavy metal effect seems to dominate [36]. Be it as it might be, depleted uranium is dangerous, but is pales in comparison with the other direct and indirect effects of war. Due to their double use properties, some chemical weapons may be masked as pesticides, fertilizers, dyes, herbicides, or defoliants. Between and more than 72 million liter herbicides were distributed over South Viet Nam [37], thereof more than 44 million liter were the defoliant agent orange, containing about kg dioxin. American scientists developed a means of thickening gasoline with the aluminum soap of naphtenic and palmitic acids into a sticky syrup that carries further from projectors and burns more slowly but at a higher temperature. This mixture, known as Napalm, can also be used in aircraft or missile-delivered warheads against military or civilian targets. A small, high explosive charge scatters the flaming liquid, which sticks to what it hits until burned out. Is Napalm still only a herbicide even when used in too large a quantity, and then accidentally affecting humans? White phosphorous is used as a shell and grenade filler in combination with a small high-explosive charge. It is both an incendiary and the best-known producer of vivid white smoke. Small bits of it burn even more intensely than Napalm when they strike personnel. In order to curb the production of chemical weapons, require their identification, e. Old and New Biological Weapons The use of biological agents as weapon has always an even more adverse world opinion than chemical warfare. A SIPRI Monograph describes among other topics the changing view of biological and toxin warfare agents, the new generation of biological weapons, the changing status of toxin weapons, a new generation of vaccines against biological and toxin weapons, and the implications of the BWC [39]. Claims that biological agents have been used as weapons of war can be found in both the written records and the artwork of many early civilizations [40]. As early as BC the Greeks polluted the wells and drinking water supplies of their enemies with the corpses of animals. Later the Romans and Persians used the same tactics. In at a battle in Tortona, Italy, Barbarossa broadened the scope of biological warfare, using the bodies of dead soldiers as well as animals to pollute wells. The use of catapults as weapons was well established by the medieval period, and projecting over the walls dead bodies of those dead of disease was an effective strategy for besieging armies. This technique continued with cholera or typhus infected corpses. There is evidence Germany used glanders and anthrax to infect horses and cattle, respectively, in Bucharest in , and employed similar tactics to infect 4, mules in Mesopotamia the next year. The period â€" can be considered the golden age of biological warfare research and development. Especially the s were the most comprehensive period of biological warfare research and development. Detailed information on the history of the US Offensive Biological Warfare Program between and can be found in ref. It has been reported recently that the US tested a Soviet-designed germ bomb and assembled a germ factory in the Nevada desert from commercially available materials, in particular to produce potentially more potent variant of the bacterium that causes anthrax, a deadly disease ideal for germ warfare [42]. It is debatable if such a research is consistent with the treaty banning biological weapons. The Former Soviet Union had an important biological weapons program, which might have extended well into the period after its dissolution [43]. For a decade after there was hope that the problem of Biological Warfare was going to be eradicated. However, the last two decades have produced indications that some eight developing nations, in addition to China and Israel, have initiated biological weapon development programs of varying degrees. BW agents, however, might be used not only in wars, but also by terrorists. It would permit bacteria, that eat petroleum or rubber for the destruction of equipment for peaceful purposes, but prohibits their use for hostile application. Toxin warfare TW agents, or toxic weapons, are toxins used for hostile purposes. TW agents unequivocally are types of chemical warfare CW agent. CW agents, or chemical weapons, are chemical substances whether gaseous, liquid, or solid, which are used for hostile purposes to cause disease or death in humans, animals or plants and which depend on their direct toxicity for their primary effect. TW agents, like all other CW agents, are inanimate and are incapable of multiplying. They are CW agents irrespective of whether they are produced by a living organism or by chemical synthesis or even whether they are responsible for the qualification of that organism as a BW agent. Nevertheless, TW agents are often mistakenly considered to be biological weapons, and definitions of biological warfare BW occasionally include TW agents. New chemical weapons agents, who are 5 to 10 times more dangerous than VX, the most dangerous toxic gas known today. The successful control of biological weapons is a daunting task [44]. Ensuring safety from biological and toxin weapons is a more complex issue than totally prohibiting chemical or nuclear weapons. This is due to the character of the relevant technologies. More than those, biotechnology is of dual-use, i. All major food crops come in a number of varieties, each usually suited to specific climate and soil conditions. These varieties have varying sensitivities to particular diseases. Crop pathogens, in turn, come in different strains or races and can be targeted efficiently against those crop brands. However, such a strategy may not work for neighboring countries, where agricultural conditions are similar to the aggressor. The spread of those organisms holds the risk of worldwide epidemic, and the use of these weapons may very well be counter productive. Any such warfare would be directed primarily against the civilian population. Due to the delays involved it would not affect immediately the outcome of a war. Nevertheless, many countries developed during the twentieth century anticrop substances. Iraq manufactured from the 70s onward wheat smut fungus, targeting wheat plants in Iran. During the Second World War the British concentrated on various herbicides. Germany investigated during the same period diseases like late blight of potatoes and leaf-infecting yellow and black wheat rusts, as well as insect pests, such as the Colorado beetle. The American efforts were substantial. They centered on products attacking crops of soybeans, sugar beets, sweet potatoes and cotton, intended to destroy wheat in the western Soviet Union, and rice in Asia, mainly China. Between and the U. According to another source [46] 36, kilograms of wheat stem rust, and additional quantity of stem rust of rye, only kilograms of rice blast were produced and stockpiled. Warfare, Terrorism, Comparative Perspective The concept of weapons of mass destruction WMD should be revisited, as pointed out in the Introduction of this article. Physical efficiency and psychological effect of these weapons may differ considerably when they are used in warfare on soldiers or in peacetime by terrorists. Industrialized countries can develop reliable and sophisticated technologies, which may not be available to small groups. Number of enemy casualties in a given period, Number of weapons employed to obtain the desired result, Delivery time of weapons, Possibility for stockpiling over extended periods, Infrastructure affected by its use, Avoidance of negative impact upon own troops and civil population, End a war quickly, No efficient defense against weapons on short or long term. Can it serve as a deterrent? Does its use have long term effects on the crop area? The efficiency of chemical and biological weapons depends heavily on its dispersion, upon the weather condition, determining the exposure and lethality for the combatants. It must be possible to store the substance in containers for long periods without degradation and without corroding the packaging material. Such an agent must be relatively resistant to atmospheric water and oxygen so that it does not lose its effect when dispersed. It must also withstand the shearing forces created by the explosion and heat when it is dispersed. Transport of these agents by long-range missiles and efficient distribution will face enormous difficulties, causing their decomposition, mainly due to the heat development of the warhead at re-entry into the atmosphere. A few developed countries may already be capable to overcome these hurdles [47]. Finding an answer to these questions can be facilitated by evaluation of previous wars. In World War I an average of one ton of agent was necessary to kill just one soldier. Chemical weapons caused 5 percent of the casualties.

Chapter 6 : PEO ACWA Facts | Program Executive Office, Assembled Chemical Weapons Alternatives (PE

Chemical weapons, lethal poison that can be disseminated as gases, aerosols or liquids, are commonly included in the classification of weapons of mass destruction. Like nuclear and biological.

Find articles by K. Raza Find articles by S. Vijayaraghavan Find articles by R. This article has been cited by other articles in PMC. Abstract Among the Weapons of Mass Destruction, chemical warfare CW is probably one of the most brutal created by mankind in comparison with biological and nuclear warfare. Chemical weapons are inexpensive and are relatively easy to produce, even by small terrorist groups, to create mass casualties with small quantities. The characteristics of various CW agents, general information relevant to current physical as well as medical protection methods, detection equipment available and decontamination techniques are discussed in this review article. A brief note on Chemical Weapons Convention is also provided. Blister agents, chemical warfare, decontamination, detection, mustards, nerve agents, protection Among the Weapons of Mass Destruction WMD , chemical warfare CW is probably one of the most brutal created by mankind. CW agents are extremely toxic synthetic chemicals that can be dispersed as a gas, liquid or aerosol or as agents adsorbed to particles to become a powder. These CW agents have either lethal or incapacitating effects on humans. Thousands of toxic substances are known, but only some of them are considered as CW agents based on their characteristics, viz. The use of poisonous chemicals from plant extracts to poison individuals is widely documented throughout the Middle Ages and Renaissance, but it was not until the expansion of industrial chemistry in the 19th century that mass production and deployment of CW agents in war became a possibility. Thus, the birth of modern CW was ushered in by the German gas attack with chlorine on 22nd April at Ypres, Belgium. The use of these toxic chemicals, including phosgene, sulfur mustard and lewisites caused , deaths and 1. The largest single CW attack killing around 5, people followed an Iraqi nerve agent attack on the Kurdish civilian population of Halabja. This attack illustrates the one single characteristic of CW agents that allows them to be considered as WMD. This has been made particularly evident by the Sarin attacks by a Japanese cult in Matsumoto city and the Tokyo subway system , causing 5, injuries and 12 deaths. The threat of using CW agents in domestic terrorist attack was demonstrated for the first time in these cases. However, mass casualties were prevented not as a consequence of the medical response but because of the inefficiency of the delivery method. Terrorists have previously used more conventional means of violence, such as bombings, assassinations and hostage taking, to promote their causes. Terrorism and criminal activities achieved a whole new quality after incidents like the repeated assaults on the World Trade Center in New York culminating in its destruction on September 11, and the subsequent dissemination of anthrax-letters. The major reasons for the production and use of such weapons are manifold. First, chemical weapons are cost-effective, particularly when used against concentrated forces or populations. Second, they may be used at lower levels of concentration with an aim to cause panic and disorder among civilians. Among the CW agents, chlorine, phosgene and cyanides are widely used in the manufacturing processes of various chemical or pharmaceutical industries. Thus, the act of terrorism might also occur in the form of a toxic chemical release, e. The effect of intentional release of CW agent varies greatly, depending on several factors, including the toxicity of the compound, its volatility and concentration, the route of exposure, the duration of the exposure and the environmental conditions. The release of such agents in an enclosed place could deliver doses high enough to injure or kill a large number of people, whereas in an open area, chemical cloud would become less concentrated as it spreads, leading possibly to numerous mild casualties. In the present time, all over the world, chemical terrorism is a serious threat to the security of mankind, whose scale essentially exceeds the impact of use of the most modem firearms. The role of the CWC is also briefly mentioned. Classification of CW Agents The CW agents possess different characteristics and belong to various classes of compounds with pronounced physicochemical, physiological and chemical properties. Based on their volatility, they are classified as persistent or non-persistent agents. The more volatile an agent, the quicker it evaporates and disperses. The more volatile agents like chlorine, phosgene and hydrogen cyanide are non-persistent agents whereas the less volatile agents like sulfur mustard and Vx are persistent agents. Based on their chemical structure, they can be classified as organophosphorus OP , organosulfur and organofluorine compounds and arsenicals. In general, classification in terms of physiological effects produced on humans by the CW agents is used for many decades. Thus, the CW agents used in warfare are classified as follows:

Chapter 7 : Chemical weapon - Wikipedia

Chemical warfare (CW) involves using the toxic properties of chemical substances as theinnatdunvilla.com type of warfare is distinct from nuclear warfare and biological warfare, which together make up NBC, the military acronym for nuclear, biological, and chemical (warfare or weapons), all of which are considered "weapons of mass destruction" (WMDs).

Ancient Greek historians recount that Alexander the Great encountered poison arrows and fire incendiaries in India at the Indus basin in the 4th century BC. Arsenical smokes were known to the Chinese as far back as c. In the second century BC, writings of the Mohist sect in China describe the use of bellows to pump smoke from burning balls of toxic plants and vegetables into tunnels being dug by a besieging army. Other Chinese writings dating around the same period contain hundreds of recipes for the production of poisonous or irritating smokes for use in war along with numerous accounts of their use. These accounts describe an arsenic -containing "soul-hunting fog", and the use of finely divided lime dispersed into the air to suppress a peasant revolt in AD. Spartan forces besieging an Athenian city placed a lighted mixture of wood, pitch, and sulfur under the walls hoping that the noxious smoke would incapacitate the Athenians, so that they would not be able to resist the assault that followed. Sparta was not alone in its use of unconventional tactics in ancient Greece; Solon of Athens is said to have used hellebore roots to poison the water in an aqueduct leading from the River Pleistos around BC during the siege of Kirrha. Research carried out on the collapsed tunnels at Dura-Europos in Syria suggests that during the siege of the town in the third century AD, the Sassanians used bitumen and sulfur crystals to get it burning. When ignited, the materials gave off dense clouds of choking sulfur dioxide gases which killed 19 Roman soldiers and a single Sassanian, purported to be the fire-tender, in a matter of two minutes. Having gained the wind of the French, he came down upon them with violence; and gassing a great quantity of quicklime, which he purposely carried on board, he so blinded them, that they were disabled from defending themselves. Leonardo da Vinci proposed the use of a powder of sulfide, arsenic and verdigris in the 15th century: Chalk, fine sulfide of arsenic, and powdered verdegris may be thrown among enemy ships by means of small mangonels , and all those who, as they breathe, inhale the powder into their lungs will become asphyxiated. It is unknown whether this powder was ever actually used. Even when fires were not started, the resulting smoke and fumes provided a considerable distraction. Although their primary function was never abandoned, a variety of fills for shells were developed to maximize the effects of the smoke. Just three years later, August 27, , the French and the Holy Roman Empire concluded the Strasbourg Agreement , which included an article banning the use of "perfidious and odious" toxic devices. The modern notion of chemical warfare emerged from the midth century, with the development of modern chemistry and associated industries. The first proposal for the use of chemical warfare was made by Lyon Playfair , Secretary of the Science and Art Department , in during the Crimean War. He proposed a cacodyl cyanide artillery shell for use against enemy ships as way to solve the stalemate during the siege of Sevastopol. It was considered by the Prime Minister, Lord Palmerston , but the British Ordnance Department rejected the proposal as "as bad a mode of warfare as poisoning the wells of the enemy. It is considered a legitimate mode of warfare to fill shells with molten metal which scatters among the enemy, and produced the most frightful modes of death. Why a poisonous vapor which would kill men without suffering is to be considered illegitimate warfare is incomprehensible. War is destruction, and the more destructive it can be made with the least suffering the sooner will be ended that barbarous method of protecting national rights. No doubt in time chemistry will be used to lessen the suffering of combatants, and even of criminals condemned to death. Later, during the American Civil War , New York school teacher John Doughty proposed the offensive use of chlorine gas, delivered by filling a inch millimeter artillery shell with two to three quarts 1. The proposal was passed, despite a single dissenting vote from the United States. The American representative, Navy Captain Alfred Thayer Mahan , justified voting against the measure on the grounds that "the inventiveness of Americans should not be restricted in the development of new weapons. Chemical weapons in World War I Gas casualties from the Battle of Estaires , April 10, A Smelling Case to allow officers to identify the gas by smell and thus act appropriately for protection and treatment The Hague Declaration of and the Hague Convention of forbade the use of "poison or poisoned weapons" in warfare, yet more than , tons of gas were produced by the end of World War I. The French were the first to use chemical weapons during the First World War, using the tear gases ethyl bromoacetate and chloroacetone. They likely did not realize that effects might be more serious under wartime conditions than in riot control. It is also likely that their use of tear gas escalated to the use of poisonous gases. Official figures declare about 1. Of these, an estimated ,, casualties were civilians. Nearby civilian towns were at risk from winds blowing the poison gases through. Civilians rarely had a warning system put into place to alert their neighbors of the danger. In addition to poor warning systems, civilians often did not have access to effective gas masks. On the sea floor, at low temperatures, mustard gas tends to form lumps within a "skin" of chemical byproducts. These lumps can wash onto shore, where they look like chunks of waxy yellowish clay. They are extremely toxic, but the effects may not be immediately apparent. An order signed by military commanders Tukhachevsky and Vladimir Antonov-Ovseyenko stipulated: This must be carefully calculated, so that the layer of gas penetrates the forests and kills everyone hiding there. Notably, while the United States delegation under Presidential authority signed the Protocol, it languished in the U. Senate until , when it was finally ratified. Italian general Rodolfo Graziani first ordered the use of chemical weapons at Gorrahei against the forces of Ras Nasibu. Fuller , who was present in Ethiopia during the conflict, stated that mustard gas "was the decisive tactical factor in the war. The Allied powers excluded Ethiopia from the United Nations War Crimes Commission established because the British feared that Ethiopia would seek to prosecute Pietro Badoglio , who had ordered the use of chemical gas in the Second Italo-Abyssinian War, but later "became a valuable ally against the Axis powers" after the fascist regime of Mussolini fell and Italy switched sides to join the Allied powers. In , Hans von Seeckt pointed the way, by suggesting that German poison gas research move in the direction of delivery by aircraft in support of mobile warfare. Also in , at the behest of the German army , poison gas expert Dr. In , German officers debated the use of poison gas versus non-lethal chemical weapons against civilians. Chemical troops were set up in Germany since and delivery technology was actively developed. Because of fear of retaliation, however, those weapons were never used against Westerners, but against other Asians judged "inferior" by imperial propaganda. According to historians Yoshiaki Yoshimi and Kentaro Awaya, gas weapons, such as tear gas, were used only sporadically in but in early , the Imperial Japanese Army began full-scale use of sneeze and nausea gas red , and from mid, used mustard gas yellow against both Kuomintang and Communist Chinese troops. For example, the Emperor authorized the use of toxic gas on separate occasions during the Battle of Wuhan from August to October

Chapter 8 : Chemical weapon - Nerve agents | theinnatdunvilla.com

Chemical warfare (CW) involves using the toxic properties of chemical substances as theinnatdunvilla.com type of warfare is distinct from nuclear warfare and biological warfare, which together make up NBC, the military initialism for Nuclear, Biological, and Chemical (warfare or weapons).

This can lead to potentially confusing differences in the way that such agents are grouped and referred to in the literature. The most common characteristics are described below in order to introduce and explain frequently used terminology. A common form of classification of chemical agents is according to the principal intended effect, e. A harassing agent disables exposed people for as long as they remain exposed. They are acutely aware of discomfort caused by the agent, but usually remain capable of removing themselves from exposure to it unless they are temporarily blinded or otherwise constrained. They will usually recover fully in a short time after exposure ends, and no medical treatment will be required. An incapacitating agent also disables, but people exposed to it may not be aware of their predicament, as with opioids and certain other psychotropic agents, or may be rendered unable to function or move away from the exposed environment. The effect may be prolonged, but recovery may be possible without specialized medical aid. A lethal agent causes the death of those exposed. This is not a particularly precise way of classifying agents, as their effects will depend on the dose received and on the health and other factors determining the susceptibility to adverse effects of the individuals exposed. CS or CN , usually a harassing agent, can be lethal if a person is exposed to a large quantity in a small closed space. On the other hand, nerve agents, which are usually lethal, might only incapacitate if individuals were exposed to no more than a low concentration for a short time. Protective measures may be aimed at reducing the level of the effect if total protection is not possible. For example, the use of pretreatment and antidotes in a nerve gas victim is unlikely to provide a complete "cure", but may well reduce what would have been a lethal effect to an incapacitating one. Another form of classification is according to the route of entry of the agent into the body see pages 38 - 42 above. Respiratory agents are inhaled and either cause damage to the lungs, or are absorbed there and cause systemic effects. Cutaneous agents are absorbed through the skin, either damaging it e. An agent may be taken up by either or both routes, depending on its physical properties or formulation. A further classification is based on the duration of the hazard. Persistent agents will remain hazardous in the area where they are applied for long periods sometimes up to a few weeks. They are generally substances of low volatility that contaminate surfaces and have the potential to damage the skin if they come into contact with it. A secondary danger is inhalation of any vapours that may be released. Persistent agents may consequently be used for creating obstacles, for contaminating strategic places or equipment, for area denial, or, finally, for causing casualties. Mustard gas and VX are persistent agents. Non-persistent agents are volatile substances that do not stay long in the area of application, but evaporate or disperse rapidly, and may consequently be used to cause casualties in an area that needs to be occupied soon afterwards. Surfaces are generally not contaminated, and the primary danger is from inhalation, and only secondarily from skin exposure. Respirators will be the main form of protection required. Protective clothing may not be necessary if concentrations are below skin toxicity levels. Hydrogen cyanide and phosgene are typical non-persistent agents. Finally, chemical agents are often grouped according to their effect on the body, the classes being differentiated according to, for example, the primary organ system that is affected by exposure. This type of classification is used in Table 3.

Chapter 9 : What are Chemical Agents and Chemical Weapons? | U.S. Army Chemical Materials Activity

Chemical weapons first were used in , when the German military released tons of chlorine gas at Ypres, Belgium, killing an estimated 5, Allied troops. Two years later, the same battlefields saw the first deployment of sulfur mustard.

Syria stated that the blast was accidental and not chemical related. First use, or preemptive use, is a violation of stated policy. Only the president of the United States can authorize the first retaliatory use. In late , a probable CW nerve agent production facility and a storage facility were identified at the Dimona Sensitive Storage Area in the Negev Desert. Other CW agent production is believed to exist within a well-developed Israeli chemical industry. Israel insisted at the time that the materials were non-toxic. Congress Office of Technology Assessment WMD proliferation assessment recorded Israel as a country generally reported as having undeclared offensive chemical warfare capabilities. Nevertheless, the country is believed to possess a substantial arsenal of chemical weapons. It reportedly acquired the technology necessary to produce tabun and mustard gas as early as the s. There are three basic configurations in which these agents are stored. The next form are aircraft-delivered munitions. This form never has an explosive component. The final of the three forms are raw agent housed in one-ton containers. A fire at one of these facilities would endanger the surrounding community as well as the personnel at the installations. You may improve this article , discuss the issue on the talk page , or create a new article , as appropriate. December Main article: The stockpiles, which have been maintained for more than 50 years, [8] are now considered obsolete. Historically, chemical munitions have been disposed of by land burial, open burning, and ocean dumping referred to as Operation CHASE. The Army then began a study of disposal technologies, including the assessment of incineration as well as chemical neutralization methods. In , that study culminated in the selection of incineration technology, which is now incorporated into what is known as the baseline system. This was to be a full-scale prototype facility using the baseline system. To address growing public concern over incineration, Congress, in , directed the Army to evaluate alternative disposal approaches that might be "significantly safer", more cost effective, and which could be completed within the established time frame. The Army was directed to report to Congress on potential alternative technologies by the end of , and to include in that report: An unintended chemical weapon release occurred at the port of Bari. A German attack on the evening of December 2, , damaged U. Government was highly criticized for exposing American service members to chemical agents while testing the effects of exposure. These tests were often performed without the consent or prior knowledge of the soldiers affected. Some chemical agents are designed to produce mind-altering changes; rendering the victim unable to perform their assigned mission. These are classified as incapacitating agents, and lethality is not a factor of their effectiveness. The likelihood of long-term effects from a single exposure is related to the severity of the exposure. The severity of exposure is estimated from the onset of signs and symptoms coupled with how long it took for them to develop. DOD is interested in their symptoms and their current status. DOD wants to be sure that the exposure is documented in their medical record, that the Department of Veterans Affairs VA is informed, and that they understand their future health risks. DOD can provide them with information regarding their exposure to share with their health care provider, and recommend follow-up if needed. While DOD has identified some individuals, they are conducting medical record screenings on units, and reviewing Post Deployment Health Assessment and Reassessment forms to identify other exposed individuals. Because these methods have limitations, individuals are encouraged to self-identify by using the DOD Hotline: Binary chemical weapon Binary munitions contain two, unmixed and isolated chemicals that do not react to produce lethal effects until mixed. This usually happens just prior to battlefield use. In contrast, unitary weapons are lethal chemical munitions that produce a toxic result in their existing state.