Selected Biological Agent Characteristics

Agent Type	Disease/Condition *Causative Agent/ Pathogen*	Description of Agent	Transmissible Person to Person	Infectivity/ Lethality	Incubation Period	Duration of Illness	Persistence/ Stability	Vaccination/ Toxoids	Rate of Action	Symptoms	Treatment	Possible Means of Delivery
BACTERIA	Anthrax (inhalation) *Bacillus anthracis*	Rod-shaped, gram-positive, aerobic sporulating micro-organism, individual spores ~(1–1.2)x(3–5)□m	No	Moderate/ High	1–7 days	3–5 days	Spores are highly stable	Yes	Symptoms in 2–3 days; Shock and death occurs with 24–36 hrs after symptoms	Fever, malaise, fatigue, cough and mild chest discomfort, followed by severe respiratory distress with dyspnea, diaphoresis, stridor, and cyanosis	Usually not effective after symptoms are present, high dose antibiotic treatment with penicillin, ciprofloxacin, or doxycycline should be undertaken. Supportive therapy may be necessary.	Aerosol.
	Brucellosis *Brucella suis, melitensis & abortus*	All non-motile, non-sporulating, gram negative, aerobic bacterium; ~(0.5-1)x(1-2)□m	No	High/Low	Days to months	Weeks to months	Organisms are stable for several weeks in wet soil and food.	Yes	Highly variable, usually 6-60 days.	Chills, sweats, headache, fatigue, myalgias, arthralgias, and anorexia. Cough may occur. Complications include sacroiliitis, arthritis, vertebral osteomyelitis, epididymoorchitis, and rarely endocarditis.	Recommended treatment is doxycycline (200 mg/day) plus rifampin (900 mg/day) for 6 weeks.	Aerosol. Expected to mimic a natural disease.
	Cholera *Vibrio cholerae*	Short, curved, motile, gram-negative, non-sporulating rod. Strongly anaerobic, these organisms prefer alkaline and high salt environments.	Negl.	Low/Moderate-High	1-5 days	1 or more weeks	Unstable in aerosols and pure water, more so in polluted water.	Yes	Sudden onset after 1-5 day incubation period.	Initial vomiting and abdominal distension with little or no fever or abdominal pain. Followed rapidly by diarrhea, which may be either mild or profuse and watery, with fluid losses exceeding 5 to 10 liters or more per day. Without treatment, death may result from severe dehydration, hypovolemia, and shock.	Therapy consists of fluid and electrolyte replacement. Antibiotics will shorten the duration of diarrhea and thereby reduce fluid losses. Tetracycline, ampicillin, or trimethoprim-sulfamethoxazole are most commonly used.	1. Sabotage (food/water supply) 2. Aerosol
	Glanders *Burkholderia mallei*	Gram-negative bacillus primarily noted for producing disease in horses, mules, and donkeys	Negl.	/Moderate-High	10-14 days	N/A	N/A	No	N/A	Inhalational exposure produces fever, rigors, sweats, myalgia, headache, pleuritic chest pain, cervical adenopathy, splenomegaly, and generalized papular/pustular eruptions. Almost always fatal without treatment.	Few antibiotics have been evaluated *in vivo*. Sulfadiazine may be effective in some cases. Ciprofloxacin, doxycycline, and rifampin have *in vitro* efficacy. Extrapolating from melioidosis guidelines, a combination of TMP-SMX + ceftazidime ± gentamicin might be considered.	Aerosol.
	Plague (pneumonic, bubonic) *Yersinia pestis*	Rod-shaped, non-motile, non-sporulating, gram-negative, aerobic bacterium; ~(0.5-1)x(1-2)□m	High	High/Very High in untreated personnel, the mortality is 100%	2 to 6 days for bubonic and 3 to 4 days for pneumonic	1-2 days	Less important because of high transmissibility.	Yes	Two to three days	High fever, chills, headache, hemoptysis, and toxemia, progressing rapidly to dyspnea, sturdier, and cyanosis. Death results from respiratory failure, circulatory collapse, and a bleeding diathesis.	Early administration of antibiotics is very effective. Supportive therapy for pneumonic and septicemic forms is required.	May be delivered via contaminated vectors (fleas) causing bubonic type, or, more likely, via aerosol causing pneumonic type.
	Shigellosis *Shigella Dysenteriae*	Rod-shaped, gram-negative, non-motile, non-sporulating bacterium	Negl.	High/Low	1-7 days (usually 2-3)	N/A	Unstable in aerosols and pure water, more so in polluted water.	No	Symptoms usually within 2-3 days, however, known to demonstrate in as little as 12 hours or as long as 7 days.	Fever, nausea, vomiting, abdominal cramps, watery diarrhea, and occasionally, traces of blood in the feces. Symptoms range from mild to severe with some infected individuals not experiencing any symptoms.	The antibiotics commonly used for treatment are ampicillin, trimethoprim/sulfamethoxazole (also known as Bactrim* or Septra*), nalidixic acid, or ciprofloxacin. Persons with mild infections will usually recover quickly without antibiotic treatment. Antidiarrheal agents such as loperamide (Imodium*) or diphenoxylate with atropine (Lomotil*) are likely to make the illness worse and should be avoided.	Contaminated food or water
	Tularemia *Francisella tularensis*	Small, aerobic, non-sporulating, non-motile, gram-negative *cocco-bacillus* ~0.2x(0.2-0.7)□m	No	High/ Moderate if untreated	1-10 days	2 or more weeks	Not very stable	Yes	Three to five days	Ulceroglandular tularemia with local ulcer and regional lymphadenopathy, fever, chills, headache, and malaise. Typhoidal or septicemic tularemia presents with fever, headache, malaise, substernal discomfort, prostration, weight loss, and non-productive cough.	Administration of anitbiotics with early treatment is very effective. Streptomycin – 1 gm I. M. q. 12 hrs x 10 10-14 d. Gentamicin – 3-5 mg/kg/day x 10-14 d.	Aerosol.
	Typhoid *Salmonella typhi*	Rod-shaped, motile, non-sporulating gram-negative bacterium	Negl.	Moderate/ Moderate if untreated	6-21 days	Several weeks	Stable	Yes	One to three days	Sustained fever, severe headache, malaise, anorexia, a relative bradycardia, splenomegaly, nonproductive cough in the early stage of the illness, and constipation more commonly than diarrhea.	Chloramphenicol amoxicillin or TMP-SMX. Quilone derivatives and third generation cephalusporins and supportive therapy.	Sabotage of food and water supplies.
RICKETTSIAE	Q-Fever *Coxiella burneti*	Bacterium-like, gram-negative organism, pleomorphic 300-700 nm	No	High/Very low	10-20	2 days to 2 weeks	Stable	Yes	Onset may be sudden	Chills, retrobulbar headache, weakness, malaise and severe sweats.	Tetracycline or doxycycline are the treatment of choice and are given orally for 5 to 7 days.	May be a dust cloud either from a line source or a point source (downwind one-half mile or more).
	Typhus (classic) *Rickettsia prowazeki*	Non-motile, minute, coccoid or rod shaped rickettsiae, in pairs or chains, 300 nm	No	High/High	6-15 days	Weeks to months	Not very stable	No	Variable onset, often sudden. Terminates by rapid lysis after about 2 weeks of fever	Headache, chills, prostration, fever, and general pain. A macular eruption appears on the fifth to sixth day, initially on the upper trunk, followed by spread to the entire body, but usually not the face, palms, or soles.	Tetracyclines or chlormphenical orally in a loading dose of 2-3 g, followed by daily doses of 1-2 g/day in 4 divided doses until ind. becomes afelorite (usually 2 days) plus 1 day.	May be delivered via contaminated vectors (lice or fleas).
VIRUSES	Encephalitis	Lipid-enveloped virions of 50-60 nm dia., icosohedral nucleocapsid w. 2 glycoproteins										
	-Eastern/Western Equine Encephalitis (EEE, WEE)		Negl.	High/High	5-15 days	1-3 weeks	Relatively unstable	Yes		Inflammation of the mengies of the brain, headache, fever, dizziness, drowsiness or stupor, tremors or convulsions, muscular incoordination.	No specific treatment; supportive treatment is essential	Airborne spread possible.
	-Venezuelan Equine Encephalitis		Low	High/Low	1-5 days	Days to weeks	Relatively unstable	Yes	Sudden	Inflammation of the mengies of the brain, headache, fever, dizziness, drowsiness or stupor, tremors or convulsions, muscular incoordination.	No specific treatment; supportive treatment is essential	Airborne spread possible.
	Hemorrhagic Fever									Malaise, myalgias, headache, vomiting, and diarrhea may occur with any of the hemorrhagic fevers	No specific treatment; intensive supportive treatment is essential	Airborne spread possible.
	-Ebola Fever	Filovirus	Moderate	High/High	7-9 days	5-16 days	Relatively unstable	No		May also include a macular dermatologic eruption.		
	-Marburg	Filovirus	Moderate					No		May also include a macular dermatologic eruption.		
	-Yellow Fever	Flavivirus. Isosahedral nucleocapsid 37-50 nm diam., lipoprotein env. w/ short surface spikes	Negl.	High/High	3-6 days	1-2 weeks	Relatively unstable	Yes	Sudden			
	Variola Virus (Smallpox)	Asymmetric, brick-shaped, rounded corners; DNA virus	High	High/High	7-17 days	1-2 weeks	Stable	Yes	2-4 days	Malaise, fever, rigors, vomiting, headache, and backache. 2-3 days later lesions appear which quickly progress from macules to papules, and eventually to pustular vesicles. They are more abundant on the extremities and face, and develop synchronously.	No specific treatment; supportive treatment is essential	Airborne spread possible.
TOXIN	Botulinum Toxin	any of the seven distinct neurotoxins produced by the bacillus, *Clostridium botulinum*	No	NA/High	Variable (hours to days)	24-72 hours/Months if lethal	Stable	Yes	12-72 hours	Initial signs and symptoms include ptosis, generalized weakness, lassitude, and dizziness. Diminished salivation with extreme dryness of the mouth and throat may cause complaints of a sore throat. Urinary retention or ileus may also occur. Motor symptoms usually are present early in the disease; cranial nerves are affected first with blurred vision, diplopia, ptosis, and photophobia. Bulbar nerve dysfunction causes dysarthria, dysphonia, and dysphagia. This is followed by a symmetrical, descending, progressive weakness of the extremities along with weakness of the respiratory muscles. Development of respiratory failure may be abrupt.	(1) Respiratory failure—tracheostomy and ventilatory assistance, fatalities should be <5%. Intensive and prolonged nursing care may be required for recovery (which may take several weeks or even months). (2) Food-borne botulism and aerosol exposure—equine antitoxin is probably helpful, sometimes even after onset of signs of intoxication. Administration of antitoxin is reasonable if disease has not progressed to a stable state. Use requires pretesting for sensitivity to horse serum (and desensitization for those allergic). Disadvantages include rapid clearance by immune elimination, as well as a theoretical risk of serum sickness.	1. Sabotage (food/water supply) 2. Aerosol
	Ricin	Glycoprotein toxin (66,000 daltons) from the seed of the castor plant	No	NA/High	Hours	Days	Stable	Not effective	6-72 hours	Rapid onset of nausea, vomiting, abdominal cramps and severe diarrhea with vascular collapse; death has occurred on the third day or later. Following inhalation, one might expect nonspecific symptoms of weakness, fever, cough, and hypothermia followed by hypotension and cardiovascular collapse.	Management is supportive and should include maintenance of intravascular volume. Standard management for poison ingestion should be employed if intoxication is by the oral route.	Aerosol
	Staphylococcal enterotoxin B	One of several exotoxins produced by *Staphylococcus aureus*	No	NA/Low	Days to weeks	Days to weeks	Stable	Not effective	30 min-6 hours	Fever, chills, headache, myalgia, and nonproductive cough. In more severe cases, dyspnea and retrosternal chest pain may also be present. In many patients nausea, vomiting, and diarrhea will also occur.	Treatment is limited to supportive care. No specific antitoxin for human use is available.	1. Sabotage (food/water supply) 2. Aerosol
	Trichothecene (T-2) Mycotoxins	A diverse group of more than 40 compounds produced by fungi.	No	NA/High	Hours	Hours	Stable	Not effective	Sudden	Victims are reported to have suffered painful skin lesions, lightheadedness, dyspnea, and a rapid onset of hemorrhage, incapacitation and death. Survivors developed a radiation-like sickness including fever, nausea, vomiting, diarrhea, leukopenia, bleeding, and sepsis.	General supportive measures are used to alleviate acute T-2 toxicoses. Prompt (within 5-60 min of exposure) soap and water wash significantly reduces the development of the localized destructive, cutaneous effects of the toxin. After oral exposure management should include standard therapy for poison ingestion.	1. Sabotage 2. Aerosol

Chemical Warfare Agent Characteristics

		PHYSICAL AND CHEMICAL PROPERTIES												PHYSIOLOGICAL ACTION						CWC
Agent Type	Chemical Agent; **Symbol** Chemical Structure	Molecular Weight	State @ 20°C	Odor	Vapor Density (Air = 1)	Liquid Density (g/cc)	Freezing/ Melting Point (°C)	Boiling Point (°C)	Vapor Pressure (mm^Hg)	Volatility (mg/m^3)	Heat of Vaporization (cal/g)	Decomposition Temperature (°C)	Flash Point	Stability	Median Lethal Dose (LD_{50}) ($mg\text{-}min/m^3$)	Median Incapacitating Dose (ID_{50})	Eye & Skin Toxicity	Rate of Action	Physiological Action	Detoxification Rate	CWC Schedule
NERVE	Tabun; **GA** $C_2H_5OPO(CN)N(CH_3)_2$	162.3	Colorless to brown liquid	Faintly fruity; none when pure	5.63	1.073 at 25°C	-5	240	0.037 @ 20°C	610 @ 25°C	79.56	150	78°C	Stable in steel at normal temperatures	15,000 by skin (vapor) or 1500 (liquid); 70 inhaled	<50 inhaled	Very high	Very Rapid	Cessation of breath -- death may follow	Slight, but definite	1.A.(2)
	Sarin; **GB** $CH_3PO(F)OCH(CH_3)_2$	140.1	Colorless liquid	Almost none when pure	4.86	1.0887 at 25°C	-56	158	2.9 @ 25°C; 2.10 @ 20°C	22,000 @ 25°C; 16,090 @ 20°C	80	150	Non-flammable	Stable when pure	10,000 by skin (vapor) or 1700 (liquid); 35 inhaled	25 inhaled	Very high	Very rapid	Cessation of breath – death may follow	cumulative	1.A.(1)
	Soman; **GD** $CH_3PO(F)OCH(CH_3)C(CH_3)_3$	182.178	Colorless liquid	Fruity; camphor when impure	6.33	1.0222 at 25°C	-42	198	0.4 @ 25°C	3,900 @ 25°C	72.4	130	High enough not to interfere w/ military use	Less stable than GA or GB	2,500 by skin (vapor) or 350 (liquid); 35 inhaled	25 inhaled	Very high	Very rapid	Cessation of breath – death may follow	Low, essentially cumulative	1.A.(1)
	(Cyclo-sarin); **GF** $CH_3PO(F)OC_6H_{11}$	180.2	Liquid	Sweet; musty; peaches; shellac	6.2	1.1327 at 20°C	-30	239	0.044 @ 20°C	438 @ 20°C	90.5	---	94°C	Relatively stable in steel	2,500 by skin (vapor) or 350 (liquid); 35 inhaled	25 inhaled	Very high	Very rapid	Cessation of breath – death may follow	Low	1.A.(1)
	VX $(C_2H_5O)(CH_3O)P(O)S(C_2H_4)N[C_2H_2(CH_3)_2]_2$	267.38	Colorless to amber liquid	None	9.2	1.0083 at 20°C	below -51	298	0.0007 @ 20°C	10.5 @ 25°C	78.2 @ 25°C	Half-life of 36 hr at 150	159°C	Relatively stable at room temperature	150 by skin (vapor) or 5 (liquid); 15 inhaled	25 by skin (vapor) or 2.5 (liquid); 10 inhaled	Very high	Very rapid	Produces casualties when inhaled or absorbed	low, essentially cumulative	1.A.(3)
	V_X ("V sub x")	211.2	Colorless liquid	None	7.29	1.062 at 20°C	---	256	0.007 @ 25°C; 0.004 @ 20°C	75 @ 25°C; 48 @ 20°C	67.2	---	---	Relatively stable	---	---	Very high	Rapid	Produces casualties when inhaled or absorbed	low, essentially cumulative	
BLISTER	Distilled Mustard; **HD** $(ClCH_2CH_2)_2S$	159.08	Colorless to pale yellow liquid	Garlic or horseradish	5.4	1.268 @ 25°C; 1.27 @ 20°C	14.45	217	0.072 @ 20°C	610 @ 20°C	94	149 – 177	105°C; ignited by large explosive charges	Stable in steel or aluminum	900 (inhaled); 5,000 by skin (vapor) or 1,400 (liquid)	500 (skin); 100 (inhaled); 25 (eyes or nose)	Eyes very susceptible; skin less so	Delayed: hours to days	Blisters; destroys tissue; injures blood cells	Very low – cumulative	1.A.(4)
	Nitrogen Mustard; **HN-1** $(ClCH_2CH_2)_2NC_2H_5$	170.08	Dark liquid	Fishy or musty	5.9	1.09 @ 20°C	-34	194	0.24 @ 25°C	1,520 @ 20°C	77	Decomposes before boiling is reached	High enough not to interfere w/ military use	Adequate	1,500 (inhaled); 20,000 (skin)	200 by eye; 9,000 by skin	Eyes susceptible to low concentration; skin less so	Delayed: 12 hours or longer	Blisters; affects respiratory tract; destroys tissue; injures blood cells	Not detoxified; cumulative	1.A.(6)
	Nitrogen Mustard; **HN-2** $(ClCH_2CH_2)_2NCH_3$	156.07	Dark liquid	Soapy (low concentrations); Fruity (high)	5.4	1.15 @ 20°C	-65 to -60	75 at 15mmHg	0.29 @ 20°C	3,580 @ 25°C	78.8	Below boiling; polymerizes with heat generation	High enough not to interfere w/ military use	Unstable	3,000 (inhaled)	<HN-1 & >HN-3; 100 by eye	Toxic to eyes; blisters skin	*Skin* – delayed 12 hrs or more; *Eyes* – faster than HD	Similar to HD; bronchopneumonia possible after 24 hours	Not detoxified; cumulative	1.A.(6)
	Nitrogen Mustard; **HN-3** $N(CH_2CH_2Cl)_3$	204.54	Dark liquid	None, if pure	7.1	1.24 @ 20°C	-37	256	0.0109 @ 25°C	121 @ 25°C	74	Below boiling point	High enough not to interfere w/ military use	Stable	1,500 (inhaled); 10,000 by skin (est.)	200 by eye; 2,500 by skin (est.)	Eyes very susceptible; skin less so	Serious effects same as HD; minor effects sooner	Similar to HN-2	Not detoxified – cumulative	1.A.(6)
	Phosgene oximedichloro-foroxime; **CX** CCl_2NOH	113.94	Colorless solid or liquid	Sharp, penetrating	3.9	--	35 to 40	53 –54 at 28mmHg	11.2 @ 25°C (solid); 13 @ 40°C (liquid)	1,800 @ 20°C	101 at 40°C	Decomposes slowly at normal temperature	---	Decomposes slowly	3,200 (inhaled)	very low	Powerful irritant to eyes and nose; liquid corrosive to skin	Immediate effects on contact	Violently irritates mucous membranes, eyes, and nose; forms wheals rapidly	---	
	Lewisite; **L** $ClCHCHAsCl_2$	207.35	Colorless to brownish	Varies; may resemble geraniums	7.1	1.89 @ 20°C	-18	190	0.394 @ 20°C	4,480 @ 20°C	58 at 0°C to 190°C	>100	None	Stable in steel and glass	1,200–1,500 (inhaled); 100,000 (skin)	<300 by eye; >1,500 to 2,000 by skin	Severe eye damage; skin less so	Rapid	Similar to HD, plus may cause systemic poisoning	Not detoxified	1.A.(5)
	Mustard-Lewisite mixture; **HL**	186.4	Dark, oily liquid	Garlic	6.5	1.66 @ 20°C	-25.4 (pure)	<190	0.248@ 20°C	2,730 @ 20°C	58 to 94	>100	High enough not to interfere w/ military use	Stable in lacquered steel	15,000 (inhaled); >10,000 (skin)	200 by eye; 1,500 to 2,000 by skin	Very high	Prompt stinging; blistering agent about 13 hours	Similar to HD, plus may cause systemic poisoning	Not detoxified	1.A.(4); 1.A.(5)
	Phenyldichlorarsine; **PD** $C_6H_5AsCl_2$	222.91	Colorless liquid	None	7.7	1.65 @ 20°C	-20	252 to 255	0.033 @ 25°C	390 @ 25°C	69	Stable to boiling point	High enough not to interfere w/ military use	Very stable	2,600 (inhaled)	16 as vomiting agent; 1,800 as blister	633 mg-min/m^3 pro-duces eye casualty; less toxic to skin	Immediate eye effects; skin effects in 30 to 60 minutes	Irritates; causes nausea, vomiting and blisters	Probably rapid	
	Ethyldichlorarsine; **ED** $C_2H_5AsCl_2$	174.88	Colorless liquid	Fruity, but biting; irritating	6.0	1.66 @ 20°C	-65	156	2.09 @ 20°C	20,000 @ 20°C	52.5	Stable to boiling point	High enough not to interfere w/ military use	Stable in steel	3,000–5,000 (inhaled); 100,000 (skin)	5 to 10 by inhalation	Vapor harmful on long exposure; liquid blisters <L	Immediate irritation; delayed blistering	Damages respiratory tract; effects eyes; blisters; can cause systemic poisoning	Rapid	
	Methyldichlorarsine; **MD** CH_3AsCl_2	160.86	Colorless liquid	None	5.5	1.836 @ 20°C	-55	133	7.76 @ 20°C	74,900 @ 20°C	49	Stable to boiling point	High enough not to interfere w/ military use	Stable in steel	3,000 – 5,000 (est.)	25 by inhalation	Eye damage possible; blisters less than HD	Immediate irritation; delayed blistering	Irritates respiratory tract; Injures lungs and eyes; Causes systemic poisoning	Rapid	
BLOOD	Hydrogen cyanide; **AC** HCN	27.02	Colorless gas or liquid	Bitter almonds	0.990 @ 20°C	0.687 @ 20°C	-13.3	25.7	742 @ 25°C; 612 @ 20°C	1,080,000 @ 25°C	233	>65.5	0°C; ignited 50% of time when disseminated by artillery shells	Stable if pure; can burn on explosion	Varies widely with concentration	Varies with concentration	Moderate	Very rapid	Interferes with body tissues' oxygen use; accelerates rate of breathing	Rapid: 0.017 mg/kg/min	3.A.(3)
	Cyanogen chloride; **CK** CNCl	61.48	Colorless gas or liquid	Pungent, biting; Can go unnoticed	2.1	1.18 @ 20°C	-6.9	12.8	1,000 @ 25°C	2,600,000 @ 20°C	103	100	None	Tends to polymerize; may explode	11,000	7,000	Low; lacrimatory and irritating	Very rapid	Chokes, irritates, causes slow breathing rate	Rapid: 0.02 to 0.1 mg/kg/min	3.A.(2)
	Arsine; **SA** AsH_3	77.93	Colorless gas	Mild garlic	2.69	1.34 @ 20°C	-116	-62.5	11,100 @ 20°C	30,900,000 @ 20°C	53.7 @ -62.5°C	280	Below detonation temp.; mixtures w/ air may explode spontaneously	Not stable in uncoated metal containers	5,000	2,500	None	Delayed 2 hours to 11 days	Damages blood, liver, and kidneys	Low	
CHOKING	Phosgene; **CG** $COCl_2$	98.92	Colorless gas	New-mown hay; green corn	3.4	1.37 @ 20°C	-128	7.6	1.173 @ 20°C	4,300,000 @ 7.6°C	59	800	None	Stable in steel if dry	3,200	1,600	None	Immediate to 3 hr. depending on conc.	Damages and floods lungs	Not detoxified – cumulative	3.A.(1)
	Diphosgene; **DP** $ClCOOCCl_3$	197.85	Colorless gas	New-mown hay; green corn	6.8	1.65 @ 20°C	-57	127–128	4.2 @ 20°C	45,000 @ 20°C	57.4	300 to 350	None	Unstable; tends to convert to CG	3,200	1,600	Slightly lacrimatory	Immediate to 3 hr. depending on conc.	Damages and floods lungs	Not detoxified – cumulative	3.A.(1)
VOMITING	Diphenylchloroarsine; **DA** $(C_6H_5)_2AsCl$	264.5	White to brown solid	None	Forms little vapor	1.387 @ 50°C	41 to 44.5	333	0.0036 @ 45°C	48 @ 45°C	56.6	300	350	Stable if pure	15,000 (est.)	12 (>10 minutes)	Irritating; not toxic	Very rapid	Like cold symptoms, plus headache, vomiting, nausea	Moderate	
	Adamsite; **DM** $C_6H_4(AsCl)\text{-}NH)C_6H_4$	277.57	Yellow to green solid	None	Forms little vapor	1.65 (solid) @ 20°C	195	410	Negligible	Negligible	80	>boiling point	None	Stable in glass or steel	Variable; avg.: 11,000	22 (1 min.); 8 (60 min. exposure)	Irritating; relatively not toxic	Very rapid	Like cold symptoms, plus headache, vomiting, nausea	Rapid in small amounts	
	Deiphenylcyanoarsine; **DC** $(C_6H_5)_2AsCN$	255.0	White to pink solid	Bitter almond-garlic mixture	Forms little vapor	1.3338 @ 35°C	31.5 to 35	350	0.0002 @ 20°C	2.8 @ 20°C	71.1	300 (25% decomposed)	Low	Stable at normal temperatures	10,000 (est.)	30 (30 sec); 20 (5 min. exposure)	Irritating; not toxic	More rapid than DM or DA	Like cold symptoms, plus headache, vomiting, nausea	Rapid	
Incapa-citating	**BZ**	337.4	White crystal	None	11.6	Bulk 0.51 solid; Crystal 1.33	167.5	320	0.03 @ 70°C	0.5 @ 70°C	62.9	begins at 170°C	246°C	Adequate	200,000 (est.)	112	---	Delayed; 1 to 4 hours depending on exposure	Fast heart beat, vomiting, dry mouth, blurred vision, stupor, increasing random activity	---	2.A.(3)
TEAR	Chloroacetophenone; **CN** $C_6H_5COCH_2Cl$	154.59	Solid	Apple blossoms	5.3	1.318 (solid) @ 20°C	54	248	0.0041 @ 20°C	34.3 @ 20°C	98	Stable to boiling point	High enough not to interfere w/ military use	Stable	7,000 to 14,000	80	Temporarily severe eye irritation; mild skin irritation	Instantaneous	Causes tearing; irritates eyes and respiratory tract	Rapid	
	Chloroacetophenone in Chloroform; **CNC**	128.17	Liquid	Chloroform	4.4	1.40 @ 20°C	0.23	variable, 60 to 247	127 @ 20°C	Indeterminate	n/a	Stable to boiling point	None	Adequate	11,000 (est.)	80	Temporarily severe eye irritation; mild skin irritation	Instantaneous	Cause tearing; irritates eyes and respiratory tract	Rapid	
	Chloroacetophenone and Chloropicrin in Chloroform; **CNS**	141.78	Liquid	Flypaper	~5	1.47 @ 20°C	2	variable, 60 to 247	78 @ 20°C	610,000 @ 20°C (includes solvent)	n/a	Stable to boiling point	None	Adequate	11,400	60	Irritating; not toxic	Instantaneous	Vomiting and choking agent as well as a tear agent	Slow because of effect of PS	
	Chloroacetophenone in Benzene and Carbon Tetrachloride; **CNB**	119.7	Liquid	Benzene	~4	1.14 @ 20°C	-7 to -30	variable 75 to 247	variable; mostly solvent vapor	Indeterminate	n/a	>247	<4.44°C	Adequate	11,000 (est.)	80	Temporarily severe eye irritation; mild skin irritation	Instantaneous	Powerfully lacrimatory	Rapid	
	Bromobenzylcyanide; **CA** $BrC_6H_4CH_2CN$	196	Yellow or solid liquid	Soured fruit	6.7	1.47 @ 25°C	25.5	Decomp oses at 242	0.011 @ 20°C	115 @ 20°C	79.5 @ 20°C	60 to 242	None	Fairly stable in glass, lead, or enamel	8,000 to 11,000 (est.)	30	Irritating; not toxic	Instantaneous	Irritates eyes and respiratory passages	Rapid in low dosage	
	O-chlorobenzylmalonitrile; **CS** $ClC_6H_4CHC(CN)_2$	188.5	Colorless solid	Pepper	---	1.04 @ 20°C	93 to 95	310 to 315	0.00034 @ 20°C	0.71 @ 25°C	53.6	---	197°C	Stable	61,000	10 to 20	Highly irritating; not toxic	Instantaneous	Highly irritating; not toxic	Rapid	
	CR $(C_6H_4)_2(O)(N)CH$	195.25	Yellow powder in solution	Burning sensation	6.7	---	72	335	0.00059 @ 20°C	0.63 @ 25°C	---	---	188°C	Stable	---	0.15	Highly irritating; not toxic	Instantaneous	Irritates skin, eyes, nose, and throat	Moderate	
	Chloropicrin; **PS** Cl_3CNO_2	164.38	Liquid	Stinging; pungent	5.6	1.66	-69	112	18.3 @ 20°C	165,000 @ 20°C	---	>400	Not flammable	Adequate; unstable in light	2,000	9	Highly irritating	Instantaneous	Acts as tear, vomiting, and choking agent	Slow	3.A.(4)

Sources: U.S. Department of the Army, *Potential Military Chemical/Biological Agents and Compounds*, U.S. Army Field Manual 3-9, (NAVFAC P-467, AFR 355-'7), 12 December 1990. Washington, D.C.: U.S. Government Printing Office.

Committee on Toxicology, National Research Council. 1997. *Review of Acute Human-Toxicity Estimates for Selected Chemical Warfare Agents*. Washington, D.C.: National Academy Press.