

**NATO HANDBOOK ON THE MEDICAL ASPECTS
OF NBC DEFENSIVE OPERATIONS
AMedP-6(B)**

PART III - CHEMICAL

ANNEX C

SUMMARY OF THE EFFECTS OF CHEMICAL AGENTS

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Table C-I. Effects of Chemical Agents

Agent	Symbol	Odour	Mechanism of action	Eyes (pupils)	Eyes (conjunctivae)	Rest of eye
Tabun; Sarin; Soman; GF.	GA GB GD GF	None or faint sweetishness, fruity or paint-like.	Anticholinesterase agents.	Miosis.	Redness.	Pain, especially on focusing, dimness of vision, headache, lachrymation.
VX	VX	None.				
Mustard and nitrogen mustard.	H HD HN	Garlic or horseradish, irritating. None or fishy, irritating.	Vesicants. Bone marrow depressant. Alkylating agents, damages DNA.	Mydriasis.	Redness, oedema, irritation, gritty pain.	Oedema of lids, pain, blepharospasm, photophobia, lachrymation, corneal ulceration and possibly scarring.
Lewisite and other arsenical vesicants.	L	Fruity to geranium- like. Irritating.	Vesicants. Arsenical poisons.		Prompt redness, oedema, irritation.	Immediate burning sensation, iritis, corneal injury.
Mustard/Lewisite mixture.	HL	Garlic-like.	Like lewisite and mustard.	Like HD, HN and L	Like HD, HN and L.	Like HD, HN and L.
Phosgene oxime.	CX	Unpleasant and irritating.	Powerful vesicant.		Violently irritating, redness, oedema.	Corneal injury with blindness, lachrymation.
Phosgene.	CG	Green corn, grass or new-mown hay.	Lung damaging agent.		Irritation.	Lachrymation (after respiratory symptoms).
Hydrogen cyanide.	AC	Faint bitter almonds.	Interferes with oxygen utilisation at cellular level.			
Cyanogen chloride.	CK	Very irritating.	Like hydrogen cyanide, lung irritant.		Irritation.	Lachrymation.
Vomiting agents.	DM DA DC	Burning fireworks, very irritating.	Local irritant, induces vomiting.		Irritation.	Lachrymation.
Irritant agents.	CN CA	Irritating.	Local irritant.		Redness, irritation.	Pain, blepharospasm, profuse lachrymation, photophobia.
	CS CR	Very irritating, pungent, pepper- like.	Local irritant.		Intense irritation.	Pain, blepharospasm, lachrymation, photophobia.
Incapacitating agents.	BZ	None.	Anticholinergic.	Mydriasis.		Blurred vision.
	LSD	None.	Psychomimetic.	Mydriasis.		

Table C-I. Effects of Chemical Agents (continued)

Symbol	Nose and throat	Respiratory tract	Skin	GI tract	Cardiovascular system
GA GB GD GF VX	Increased salivation. Rhinorrhoea.	Tightness in the chest, bronchoconstriction, occasional wheezing, increased bronchial secretion, cough, dyspnoea, substernal tightness.	Sweating, pallor then cyanosis.	Salivation, anorexia, nausea, vomiting, abdominal cramps, epigastric tightness, heartburn, eructation, diarrhoea, tenesmus, involuntary defecation.	Occasional early transient tachycardia and/or hypotension followed by bradycardia and hypotension.
H HD HN	Swelling, irritation, ulceration, discharge, occasional oedema of larynx.	Slowly developing irritation, hoarseness, aphonia, cough, tightness, dyspnoea, rales. Pneumonia, fever, pulmonary oedema, in severe cases. Risk of secondary infection.	No immediate signs. After minutes to hours, redness and burning. Several hours later blisters surrounded by redness and itching. Several days later necrosis, generally limited to epidermis. Delayed hyper- and hypo-pigmentation. Moist areas affected most. Risk of secondary infection.	Pain, nausea, vomiting, diarrhoea.	Shock after severe exposure.
L HL	Prompt irritation.	Rapid irritation, hoarseness, aphonia, cough, pneumonia, fever, pulmonary oedema, pleural effusion in severe cases.	Prompt burning. Red within 30 minutes. Blisters on 1st or 2nd day. Pain worse and necrosis deeper than H.	Diarrhoea, nausea, vomiting, hepatic failure.	Shock after severe exposure. Haemolytic anaemia, haemo-concentration.
CX	Very irritating to mucous membranes.	Rapid irritation and coughing. Later pulmonary oedema.	Immediate severe irritation and intense pain. Within 1 minute the affected area turns white, surrounded by erythema. Swollen within 1 hour; blistered after 24 hours. Necrosis may occur. Long recovery (1-3 months).		
CG	Irritation.	Coughing, choking, chest tightness on exposure. Latent period, then pulmonary oedema, dyspnoea, frothy sputum, rales, pneumonia and fever.	Possible cyanosis following pulmonary oedema.	Nausea, occasional vomiting after respiratory symptoms.	Shock after severe exposure, hypotension and tachycardia.
AC		Deep respiration followed rapidly by dyspnoea, gasping then cessation of respiration.	Initially pinker than usual; may change to cyanosis.	Nausea.	Profound hypotension.
CK	Irritation.	Irritation, cough, choking, dyspnoea; pulmonary oedema can be rapid.		Like hydrogen cyanide.	
DM DA DC	Pain, rhinorrhoea, tightness, sneezing.	Tightness and pain, uncontrollable coughing.	Stinging, (especially of face), occasional dermatitis.	Salivation, nausea vomiting.	
CN CA	Irritation, burning.	Tightness and irritation if concentration is high.	Stinging, (especially of face) occasional dermatitis, may blister.	Occasional vomiting.	
CS CR	Irritation, burning, tightness.	Tightness in chest and difficulty breathing.	Stinging, occasional dermatitis, may blister.	Nausea and vomiting.	
BZ	Extreme dryness.		Dry, flushed.	Constipation.	Tachycardia, elevated blood pressure.
LSD			Sweaty palms, cold extremities.		Tachycardia.

Table C-I. Effects of Chemical Agents (continued)

Symbol	Genito-urinary system	Central nervous system	Other	Treatment
GA GB GD GF VX	Frequent micturition, urinary incontinence.	Apprehension, giddiness, insomnia, headache, drowsiness, difficulty concentrating, poor memory, confusion, slurred speech, ataxia, weakness, coma with areflexia, Cheyne-Stokes respiration, convulsions.	Fasciculations, easy fatigue, cramps, weakness (including respiratory muscles), paralysis.	Pre-treatment with pyridostigmine. Post-exposure therapy: a. Cholinergic blockage - atropine. b. Enzyme reactivation - oximes. c. Anticonvulsant - diazepam. d. Assisted ventilation. e. Suction for respiratory secretions.
H HD HN		Anxiety, depression.	Late depression of bone marrow, malaise and prostration.	Eyes: antibiotics, cyclopegics and systemic analgesia. Skin: local dressings and antibiotics for infection. Antibiotics for respiratory infection. IV fluids.
L	Renal failure.	Anxiety, depression.	Systemic arsenic poisoning.	Like sulphur and nitrogen, mustards. BAL in oil IM for systemic chelation. BAL ointment for eyes and skin.
HL		Anxiety, depression.		Like sulphur mustard, nitrogen mustard and lewisite.
CX		Anxiety, depression.		Apply dressings of sodium bicarbonate. Systemic analgesics. Treat as any other necrotic skin lesion.
CG		Anxiety, depression.		Corticosteroids IV and by inhalation promptly may be life-saving. Rest, oxygen, antibiotics.
AC		May have initial excitation; then depression, giddiness, headache, irrational behaviour, ataxia, convulsions or coma.		Drugs binding cyanide: a. Methaemoglobin formers; nitrites or DMAP. b. Scavengers; dicobalt edetate and hydroxocobalamin. Provision of S-groups; thiosulphate. Assisted ventilation. Oxygen.
CK				Like hydrogen cyanide and phosgene.
DM DA DC		Severe headache, mental depression.	May cause desire to remove respirator.	Wear mask in spite of symptoms. Spontaneous improvement.
CN CA		Headache.		Spontaneous improvement. Analgesic eye and nose drops if necessary.
CS CR		Headache.		Symptoms disappear rapidly in fresh air.
BZ	Urgency, urinary retention.	Headache, giddiness, drowsiness, disorientation, hallucinations and occasional maniacal behavior. Ataxia and/or lack of coordination.		Restraint, cool environment. Physostigmine. Treatment may be required over several days.
LSD		Mental excitation, poor concentration, tremor indecisiveness, inability to act in a sustained or purposeful manner. Hallucinations.	Pyrexia.	Reassurance, restraint, prompt evacuation, diazepam.