

CHEMICAL TERRORISM AGENTS AND SYNDROMES: Watch for these signs and symptoms

Agents	Signs	Symptoms	Onset	Clinical Diagnostic Tests	Exposure Route and Treatment	Differential diagnosis
Nerve Agents: Sarin (GB); Tabun (GA); Soman (GD); Cyclohexyl Sarin (GF); VX; Novichok agents, other organophosphorus compounds including carbamates and pesticides	Pinpoint pupils (miosis) Bronchoconstriction Respiratory arrest Hypersalivation Increased secretions Diarrhea Decreased memory, concentration Loss of consciousness Seizures	Moderate exposure: Diffuse muscle cramping, runny nose, difficulty breathing, eye pain, dimming of vision, sweating, muscle tremors. High exposure: The above plus sudden loss of consciousness, seizures, flaccid paralysis (late sign)	Aerosols: Seconds to minutes Liquids: minutes to hours	Red blood cell or serum cholinesterase (whole blood) Treat based on signs and symptoms; lab tests only for later confirmation	Inhalation and dermal absorption Atropine (2mg) IV; repeat q 5 minutes, titrate until effective, average dose 6 to >15 mg – use IM in the field before IV access (establish airway for oxygenation) Pralidoxime chloride (2-PAMCl) 600-1800 mg IM or 1.0 g IV over 20-30 minutes (maximum 2 g IM or IV per hour) Additional doses of atropine and 2-PAMCl depending on severity Diazepam or lorazepam to prevent seizures if >4 mg atropine given Ventilatory support	Poisoning from organophosphate and carbamate pesticides may occur as a result of occupational exposure Cyanide poisoning Myasthenia gravis
Cyanides: hydrogen cyanide (HCN), cyanogen chloride	Moderate exposure: Metabolic acidosis, venous blood-O ₂ level above normal, hypotension, “pink” skin color High exposure: Above signs plus coma, convulsions, cessation of respiration and heartbeat	Moderate exposure: Giddiness, palpitations Dizziness, nausea, vomiting, headache, eye irritation, increase in rate and depth of breathing (hyperventilation), drowsiness High exposure: Immediate loss of consciousness, convulsions and death within 1 to 15 minutes	Seconds to minutes	Bitter almond odor associated with patient suggests cyanide poisoning Metabolic acidosis Cyanide (blood) or thiocyanate (blood or urine) levels Treat based on signs and symptoms; lab tests only for later confirmation	Inhalation, ingestion and dermal absorption 100% oxygen by face mask; intubation with 100% FiO ₂ if indicated Amyl nitrite via inhalation, 1 ampule (0.2 mL) q 5 minutes Sodium nitrite (300 mg IV over 5-10 minutes) and sodium thiosulfate (12.5 g IV) Additional sodium nitrite should be based on hemoglobin level and weight of patient	Similar CNS illness can result from: Industrial/occupational exposure to HCN and derivatives; carbon monoxide (CO) exposure from incomplete combustion of natural gas or petroleum fuels (exhaust fumes in enclosed areas); hydrogen sulfide (H ₂ S) exposure from sewers, animal waste, industrial sources) Poisoning from nerve agents
Vesicants/Blister Agents: sulfur mustard, lewisite, nitrogen mustard, mustard lewisite, phosgene-oxime	Skin erythema and blistering; watery, swollen eyes; upper airways sloughing with pulmonary edema; metabolic failure; neutropenia and sepsis (esp. sulfur mustard, late in course)	Burning, itching, or red skin Mucosal irritation (prominent tearing, and burning and redness of eyes) Shortness of breath Nausea and vomiting	Lewisite, minutes; Sulfur mustard, hours to days	Often smell of garlic, horseradish, and/or mustard on body Oily droplets on skin from ambient sources Urine thiodiglycol Tissue biopsy (USAMRICD)	Inhalation and dermal absorption Mustards no antidote For lewisite and lewisite/mustard mixtures: British Anti-Lewisite (BAL or Dimercaprol) IM (rarely available) Thermal burn therapy; supportive care (respiratory support and eye care)	Diffuse skin exposure with irritants, such as caustics, sodium hydroxides, ammonia, etc., may cause similar syndromes. Sodium hydroxide (NaOH) from trucking accidents
Pulmonary/Choking Agents: phosgene, chlorine, diphosgene, chloropicrin, oxides of nitrogen, sulfur dioxide	Pulmonary edema with some mucosal irritation (greater water solubility of agent = greater mucosal irritation) leading to ARDS or non-cardiogenic pulmonary edema Pulmonary infiltrate	Shortness of breath Chest tightness Wheezing Laryngeal spasm Mucosal and dermal irritation and redness	1-24 hours (rarely up to 72 hours); May be asymptomatic period of hours	No tests available but history may help identify source and exposure characteristics (majority of incidents generating exposures to humans involve trucking with labels on vehicle)	Inhalation No antidote Management of secretions; O ₂ therapy; consider high dose steroids to prevent pulmonary edema (demonstrated benefit only for oxides of nitrogen) Treat pulmonary edema with PEEP to maintain PO ₂ above 60 mm Hg	Mucosal irritation, airway reactions, and deep lung effects depend on the specific agent, especially water solubility
Ricin (castor bean oil extract)	Clusters of acute lung or GI injury; circulatory collapse and shock, tracheobronchitis, pulmonary edema, necrotizing pneumonia	Ingestion: Nausea, diarrhea, vomiting, fever, abdominal pain Inhalation: chest tightness, coughing, weakness, nausea, fever	18-24 hours 8-36 hours	ELISA (from commercial laboratories) using respiratory secretions, serum, and direct tissue	Inhalation and Ingestion No antidote Supportive care For ingestion: charcoal lavage	Tularemia, plague, and Q fever may cause similar syndromes, as may biological weapons and chemical weapon agents such as Staphylococcal enterotoxin B and phosgene
T-2 mycotoxins: Fusarium, Myrothecium, Trichoderma, Verticimonosporium, Stachybotrys	Mucosal erythema and hemorrhage (intestinal necrosis) Red skin, blistering Increased salivation Pulmonary edema Seizures and coma Liver/renal dysfunction	Dermal and mucosal irritation; blistering, necrosis Blurred vision, eye irritation, tearing Nausea, vomiting, and diarrhea Ataxia coughing and dyspnea	2-4 hours	ELISA from commercial laboratories Gas chromatography/Mass spectroscopy in specialized laboratories	Inhalation and dermal contact No antidote Supportive care For ingestion: charcoal lavage Consider high dose steroids	Pulmonary toxins (O ₃ , NO _x , phosgene, NH ₃) may cause similar syndromes though with less mucosal irritation.