Chemical Agents and Syndromes (Including Biologic Toxins)

Agents	Symptom Onset	Symptoms	Signs	Clinical Diagnostic Tests	Decontamination	Exposure Route and Treatment	Differential Diagnostic Considerations
Nerve agents	Vapor: seconds Liquid: minutes to hours	**Moderate exposure:** Diffuse muscle cramping, runny nose, difficulty breathing, eye pain, dimming of vision, sweating, diarrhea **High Exposure:** The above plus sudden loss of consciousness, flaccid paralysis, seizures **Delayed Onset:** The onset of symptoms may be delayed up to 18 hours, especially with local exposures	Pinpoint pupils (miosis): often absent without conjunctival exposure to vapor, excessive lacrimation, pulmonary secretions, wheezing, muscle twitching and rippling under the skin (fasciculations), sweating, hyper-salivation, diarrhea, seizures, apnea	Red blood cell or serum cholinesterase (whole blood) **Treatment based on signs and symptoms; use lab tests only for later confirmation** Collect urine for later confirmation and dose estimation	Rapid disrobing, water wash with soap and shampoo	**Inhalation and dermal absorption** Atropine 2 – 6 mg IV or IM, 2-PAMCl 600-1800 mg injection or 1.0 g infusion over 20-30 minutes, additional atropine 2 mg q 3-5 min to decreased secretions. One additional 2-PAMCl 600 mg injection or 1.0 g infusion over 20-30 minutes at 1 hr if necessary, diazepan or lorazepam to prevent seizures in patients with severe exposure requiring 6 mg atropine at one time, ventilation support	Pesticide poisoning from organophosphorus agents and carbamates cause virtually identical syndromes
Cyanide	Seconds to minutes	**Moderate exposure:** Dizziness, nausea, headache, eye irritation **High Exposure:** Loss of consciousness	**Moderate exposure:** non-specific findings, gasping, flushing (typically not cyanosis) **High Exposure:** convulsions, cessation of respiration	Cyanide (blood) or thiocyanate (blood or urine) levels in lab; increased arteriovenous oxygen difference **Treatment based on signs and symptoms; use lab tests only for later confirmation**	Clothing removal	**Inhalation and dermal absorption** Oxygen (face mask), amyl nitrite, sodium nitrite (300mg IV) and sodium thiosulfate (12.5g IV)	Similar CNS illness results from: Carbon monoxide (from gas or diesel engine exhaust fumes in closed spaces) H_2S (sewer, waste, industrial sources) Sulfer mustard symptoms of pain usually delayed; lewisite symptoms usually immediate
Blister agents (Sulfur mustard)	2 - 48 hours	Burning, itching, or red skin, mucosal irritation (prominent tearing, and burning and redness of eyes), shortness of breath, nausea and vomiting	Skin erythema, blistering, conjunctivitis and lid swelling, upper airways sloughing, pulmonary edema, marrow suppression with lymphocytopenia	Often smell of garlic, horseradish, and mustard on body, oily droplets on skin from ambient sources, no specific diagnostic tests	Clothing removal, large amounts of water	**Inhalation, dermal absorption and oral ingestion** Thermal burn type treatment, supportive care, for Lewisite and Lewisite/ Mustard mixtures: British Anti-Lewisite (BAL or Dimercaprol)	Diffuse skin exposure with irritants, such as caustics, sodium hydroxides, ammonia, etc., may cause similar syndromes. Sodium hydroxide (NaOH) from trucking accidents
Pulmonary agents (Phosgene, etc.)	1 - 24 hours (rarely up to 72) hours	Shortness of breath, chest tightness, wheezing, mucosal and dermal irritation and redness	Pulmonary (non-cardiogenic) edema with some mucosal irritation (signs after symptoms)	No tests available but source assessment may help identify exposure characteristics (majority of trucking incidents generating exposures to humans have labels on vehicle)	None usually needed	**Inhalation** Supportive care; specific treatment depends on agents; consider steroids	Inhalation exposures are the single most common form of industrial agent exposure (e.g.: phosgene, chlorine) Mucosal irritation, airways reactions, and deep lung effects depend on the specific agent
Ricin (castor bean toxin)	18 - 24 hours	**Ingestion:** Nausea, diarrhea, vomiting, fever, abdominal pain **Inhalation:** chest tightness, coughing, weakness, nausea, fever	Clusters of acute lung or GI injury; circulatory collapse and shock	ELISA (from commercial laboratories) using respiratory secretions, serum, and direct tissue	Clothing removal, water rinse	**Inhalation and ingestion** Supportive care; for ingestion: charcoal lavage	Tularemia, plague, and Q fever may cause similar syndromes, as may CW such as Staphylococcal enterotoxin B and phosgene
T-2 mycotoxin	2-4 hours	Dermal and mucosal irritation; blistering, necrosis, blurred vision, eye irritation, nausea, vomiting and diarrhea, ataxia, coughing and dyspnea	Mucosal erythema and hemorrhage, red skin, blistering, tearing, salivation, pulmonary edema, seizures and coma	ELISA from commercial laboratories, gas chromatography/ mass spectroscopy in specialized laboratories	Clothing removal, water rinse	**Inhalation and dermal contact** Supportive care; For ingestion: charcoal lavage. Possibly high dose steroids	Pulmonary toxins (0_3, NO_x, phosgene, NH_3) may cause similar syndromes though with less mucosal irritation.

Chemical Agents: General Guidance*

Diagnosis: Be Alert to the Following:

- Groups of individuals becoming ill around the same time
- Any sudden increase of illness in previously healthy individuals
- Any sudden increase in the following non-specific illnesses:
  - Sudden unexplained weakness in previously healthy individuals
  - Dimmed or blurred vision
  - Hypersecretion syndromes (like drooling, tearing, and diarrhea)
  - Inhalation syndromes (eye, nose, throat, chest irritation; shortness of breath)
  - Burn-like skin syndromes (redness, blistering, itching, sloughing)
- Unusual temporal or geographic clustering of illness (for example, patients who attended the same public event, live in the same part of town, etc.)

Understanding Exposure:

- Exposure may occur from vapor or liquid droplets and, less likely, contamination of food or water
- Chemical effects are dependent on:
  - volatility and amount of a chemical
  - water solubility (higher solubility leads to more mucosal and less deep lung deposition and toxicity)
  - increased fat solubility and smaller molecular size increased skin absorption

Confirmation and Sources of Assistance and Support

- Contact your local poison control center
- Contact your local industrial hygienist or safety officer
- Department of Justice (DOJ) Domestic Preparedness National Response Hotline (800) 424-8802
- If you need further help in clinical diagnosis or management, call DOJ Chembio Help Line (800) 368-6498
- Review US Army Chemical Casualty Care handbook (go to http://ccc.apgea.army.mil or www.oqp.med.va.gov/cpg/BCR/BCR_Base.htm
- CDC/ATSDR Hotline (770) 488-7100

Decontamination Considerations

- Chemical warfare agents usually require removal of clothing and decontamination of the patient with soap and water. Avoid bleach
- Treating contaminated patients in the emergency room before decontamination may contaminate the facility
- Assume patients are contaminated unless otherwise documented
- Time is of the essence

Institutional Reporting

- If a reasonable suspicion of chemical attack, contact hospital leadership (Chief of Staff, Hospital Director, etc.)
- Immediately discuss hospital emergency planning implications

Public Health Reporting

- Contact local public health office (city, county, or state)
- If needed, contact the FBI (for location of nearest office, see http://www.fbi.gov/contact/fo/fo.htm)

* The information in this card is not meant to be complete, but to be a quick guide. Please consult other references and expert opinion and check drug dosages, particularly for pregnancy and children.

Information source: the Employee Education System for the Office of Public Health and Environmental Hazards, Department of Veterans Affairs