SUBSTANCE IDENTIFICATION
Found as a colorless gas or colorless to yellow liquids with an odor of fish or ammonia. Used in the manufacture of explosives, detergents, dyes, pharmaceuticals, stabilizers, surfactants, soaps and detergents, pesticides, plastics, paints. Also used as solvents and photographic chemicals. By-products of rubber manufacturing processes.

ROUTES OF EXPOSURE
Skin and eye contact
Inhalation
Ingestion
Skin absorption

TARGET ORGANS
Primary
Skin
Eyes
Cardiovascular system
Respiratory system
Gastrointestinal system
Hepatic
Blood
Secondary
Central nervous system
Renal

LIFE THREAT
Pulmonary edema, cardiac depression and seizures.

SIGNS AND SYMPTOMS BY SYSTEM
Cardiovascular: Cardiac depression resulting in arrhythmias and cardiovascular collapse. Direct damage to the myocardium. Hemorrhagic shock.
Respiratory: Irritation of the respiratory tract. Dyspnea, coughing, sneezing, noncardiac chest pain, hemorrhagic pulmonary lesions, and pulmonary edema. Some products may cause respiratory tract sensitization.
CNS: CNS depression, coma, and seizures.
Gastrointestinal: Irritation and burns of the mucous membranes, nausea, vomiting, and increased salivation may be present.
Eye: Visual disturbances, chemical conjunctivitis, corneal burns.
Skin: Irritant dermatitis, chemical burns, and ecchymosis.
Hepatic: Liver damage.
Renal: Kidney damage.
Blood: Coagulation problems manifested by decreased platelet count (thrombocytopenia) have been reported with nitrosamines. Methemoglobinemia secondary to NOx thermal degradation production possible.
Other: Human carcinogen risk (nitrosamines).
SYMPTOM ONSET FOR ACUTE EXPOSURE
Immediate
Some symptoms (pulmonary edema) possibly delayed

CO-EXPOSURE CONCERNS
Methemoglobin formers
Nitrogen oxides

THERMAL DECOMPOSITION PRODUCTS INCLUDE
Carbon dioxide
Carbon monoxide
Nitrogen oxides

MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE
Respiratory disorders (COPD, asthma, bronchitis)
Liver disorders
Bleeding disorders

DECONTAMINATION
· Wear positive-pressure SCBA and protective equipment specified by references such as the DOT Emergency Response Guidebook or CANUTEC Initial Emergency Response Guide. If special chemical protective clothing is required, consult the chemical manufacturer or specific protective clothing compatibility charts.
· Delay entry until trained personnel and proper protective equipment are available.
· Remove patient from contaminated area.
· Quickly remove and isolate patient’s clothing, jewelry, and shoes.
· Gently brush away dry particles and blot excess liquids with absorbent material.
· Rinse patient with warm water, 30° C/86° F, if possible.
· Wash patient with Tincture of Green soap or a mild liquid soap and large quantities of water.
· Speed in removing product from skin is essential in limiting tissue damage.
· Refer to decontamination protocol in Section Three.

IMMEDIATE FIRST AID
· Ensure that adequate decontamination has been carried out.
· If victim is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask as trained. Perform CPR as necessary.
· Immediately flush contaminated eyes with gently flowing water.
· Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration.
· Keep victim quiet and maintain normal body temperature.
· Obtain medical attention.

BASIC TREATMENT
· Establish a patent airway. Suction if necessary.
· Watch for signs of respiratory insufficiency and assist ventilations if necessary.
· Administer oxygen by nonrebreather mask at 10 to 15 L/min.
· Monitor for pulmonary edema and treat if necessary (refer to pulmonary edema protocol in Section Three).
· Monitor for shock and treat if necessary (refer to shock protocol in Section Three).
· Anticipate seizures and treat if necessary (refer to seizure protocol in Section Three).
· For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport (refer to eye irrigation protocol in Section Three).

· Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal (refer to ingestion protocol in Section Three and activated charcoal protocol in Section Four).

· Cover skin burns with dry sterile dressings after decontamination (refer to chemical burn protocol in Section Three).

ADVANCED TREATMENT

· Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious or has severe pulmonary edema.

· Positive-pressure ventilation techniques with a bag-valve-mask device may be beneficial.

· Monitor cardiac rhythm and treat arrhythmias as necessary (refer to cardiac protocol in Section Three).

· Start an IV with D5W TKO. Use lactated Ringer’s if signs of hypovolemia are present. Watch for signs of fluid overload.

· Administer 1% solution methylene blue if patient is symptomatic with severe hypoxia, cyanosis, and cardiac compromise not responding to oxygen. DIRECT PHYSICIAN ORDER ONLY (refer to methylene blue protocol in Section Four).

· Consider drug therapy for pulmonary edema (refer to pulmonary edema protocol in Section Three).

· For hypotension with signs of hypovolemia, administer fluid cautiously. If patient is unresponsive to these measures, vasopressors may be helpful. Watch for signs of fluid overload (refer to shock protocol in Section Three).

· Treat seizures with diazepam (Valium) (refer to diazepam protocol in Section Four).

· Use proparacaine hydrochloride to assist eye irrigation (refer to proparacaine hydrochloride protocol in Section Four).

INITIAL EMERGENCY DEPARTMENT CONSIDERATIONS

· Useful initial laboratory studies include complete blood count, platelet count, coagulation profile, serum electrolytes, blood urea nitrogen (BUN), creatinine, glucose, urinalysis and baseline biochemical profile, including serum aminotransferases (ALT and AST), calcium, phosphorus, and magnesium. Arterial blood gases (ABGs), chest radiograph, and electrocardiogram may be required.

· Monitor blood methemoglobin levels and treat with methylene blue if patient is symptomatic and/or has a blood methemoglobin level greater than 30% (refer to methylene blue protocol in Section Four).

· Positive end-expiratory pressure (PEEP)-assisted ventilation may be necessary in patients with acute parenchymal injury who develop pulmonary edema or adult respiratory distress syndrome.

· Obtain toxicological consultation as necessary.
Ammonia and Related Compounds

SUBSTANCE IDENTIFICATION
Found as ammonia in solution and as a colorless, water-soluble alkaline gas. Used as cleaning agents, fertilizers, industrial refrigerants; intermediate in the manufacture of inorganic and organic nitrogen-containing compounds; used in dyeing, synthetic fibers, and as a neutralizing agent. Reacts with water to form ammonium hydroxide. On skin contact, liquefied ammonia may cause frostbite.

ROUTES OF EXPOSURE
Skin and eye contact
Inhalation
Ingestion

TARGET ORGANS
Primary
Skin
Eyes
Respiratory system
Gastrointestinal system
Secondary
Central nervous system
Cardiovascular system

LIFE THREAT
Pulmonary edema and hypotension.

SIGNS AND SYMPTOMS BY SYSTEM
Cardiovascular: Ventricular arrhythmias and hypotension.
Respiratory: Respiratory tract irritation with possible laryngeal edema, pulmonary edema, bronchospasm, stridor, cough, dyspnea, and chest pain.
CNS: Stupor, lethargy, and coma.
Gastrointestinal: Hemorrhage caused by liquefaction necrosis of the GI tract mucosa.
Eye: Chemical conjunctivitis with vapor exposure, conjunctivitis, corneal damage, and blindness with liquid and anhydrous gas exposures.
Skin: Full- and partial-thickness burns with liquefaction necrosis and/or frostbite with skin contact.

SYMPTOM ONSET FOR ACUTE EXPOSURE
Immediate
Respiratory symptoms possibly delayed

CO-EXPOSURE CONCERNS
Other alkalies

THERMAL DECOMPOSITION PRODUCTS INCLUDE
Ammonia
Hydrogen
Nitrogen oxides
**MEDICAL CONDITIONS POSSIBLE AGGRAVATED BY EXPOSURE**

Respiratory system disorders  
Liver disorders  
Skin disorders  

**DECONTAMINATION**

- Wear positive-pressure SCBA and protective equipment specified by references such as the DOT Emergency Response Guidebook or the CANUTEC Initial Emergency Response Guide. If special chemical protective clothing is required, consult the chemical manufacturer or specific protective clothing compatibility charts.  
- Delay entry until trained personnel and proper protective equipment are available.  
- Remove patient from contaminated area.  
- Quickly remove and isolate patient’s clothing, jewelry, and shoes. If clothing is frozen (adherent) to skin, rinse with water before removal to prevent additional tissue damage.  
- Gently brush away dry particles and blot excess liquids with absorbent material.  
- Rinse patient with warm water, 30°C/86°F, if possible.  
- Wash patient with Tincture of Green soap or a mild liquid soap and large quantities of water.  
- Refer to decontamination protocol in Section Three.  

**IMMEDIATE FIRST AID**

- Ensure that adequate decontamination has been carried out.  
- If victim is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask as trained. Perform CPR as necessary.  
- Immediately flush contaminated eyes with gently flowing water.  
- Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration.  
- Keep victim quiet and maintain normal body temperature.  
- Obtain medical attention.  

**BASIC TREATMENT**

- Establish a patent airway. Suction if necessary.  
- Watch for signs of respiratory insufficiency and assist ventilations if necessary.  
- Administer oxygen by nonrebreather mask at 10 to 15 L/min.  
- Monitor for signs of pulmonary edema and treat if necessary (refer to pulmonary edema protocol in Section Three).  
- Monitor for shock and treat if necessary (refer to shock protocol in Section Three).  
- For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport (refer to eye irrigation protocol in Section Three).  
- Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool (refer to ingestion protocol in Section Three).  
- Do not attempt to neutralize.  

**ADVANCED TREATMENT**

- Consider orotracheal or nasotracheal intubation for airway control if signs of upper airway obstruction are present or if the patient is unconscious or has severe pulmonary edema.
Ammonia and Related Compounds

- Positive-pressure ventilation techniques with a bag-valve-mask device may be beneficial.
- Monitor cardiac rhythm and treat arrhythmias if necessary (refer to cardiac protocol in Section Three).
- Start an IV with D5W TKO. Use lactated Ringer’s if signs of hypovolemia are present. Watch for signs of fluid overload.
- Consider drug therapy for pulmonary edema (refer to pulmonary edema protocol in Section Three).
- For hypotension with signs of hypovolemia, administer fluid cautiously. Consider vasopressors if patient is hypotensive with a normal fluid volume. Watch for signs of fluid overload (refer to shock protocol in Section Three).
- Use proparacaine hydrochloride to assist eye irrigation (refer to proparacaine hydrochloride protocol in Section Four).

INITIAL EMERGENCY DEPARTMENT CONSIDERATIONS

- Useful initial laboratory studies include complete blood count, serum electrolytes, blood urea nitrogen (BUN), creatinine, glucose, urinalysis, and baseline biochemical profile, including serum aminotransferases (ALT and AST), calcium, phosphorus, and magnesium. Arterial blood gases (ABGs), chest radiograph, and electrocardiogram may be required.
- Positive end-expiratory pressure (PEEP)-assisted ventilation may be necessary in patients with acute parenchymal injury who develop pulmonary edema or adult respiratory distress syndrome.
- Exposure victims with inhalation exposure and respiratory symptoms should be observed in hospital for 24 hours.
- Endoscopy may be required for evaluation of oral ingestion.
- Obtain toxicological consultation as necessary.

SPECIAL CONSIDERATIONS

- Mixing ammonia and hypochlorite bleaches produces chloramine gas.
- Mixing ammonia and chlorine cleaners may result in the release of hydrochloric acid, nitrogen oxides, and chlorine active compounds.
Hypochlorite and Related Compounds

SUBSTANCE IDENTIFICATION
Found as a solid in white crystal form. Also found in solution. Used as bleaches, fungicides, chlorinating agents, disinfectants, and deodorants and in water purification processes. Severity of symptoms depends on concentration, type, and volume of product.

ROUTES OF EXPOSURE
Skin and eye contact
Inhalation
Ingestion

TARGET ORGANS
Primary
Skin
Eyes
Respiratory system
Gastrointestinal tract
Secondary
Central nervous system
Cardiovascular system
Metabolism

LIFE THREAT
Circulatory collapse, respiratory tract irritation with possible upper airway obstruction, and pulmonary edema.

SIGNS AND SYMPTOMS BY SYSTEM
Cardiovascular: Cardiovascular collapse and tachycardia.
Respiratory: Respiratory tract irritation that may lead to upper airway (glottic) edema and obstruction. Stridor, wheezing, pulmonary edema with dyspnea, tachypnea.
CNS: CNS confusion, delirium, depression, coma. and, rarely, seizures.
Gastrointestinal: Pain and irritation of the mucous membranes, nausea, vomiting (hematemesis), diarrhea, and abdominal pain.
Eye: Chemical conjunctivitis and corneal damage.
Skin: Irritant dermatitis and burns.
Metabolism: Hyperchloremia acidosis or hypernatremia is possible with concentrated product ingestion.
Other: If mixed with acids or heated, some products may release chlorine gas and other chlorine active compounds. When hypochlortes are mixed with ammonia, chloramine gas may be released.

SYMPTOM ONSET FOR ACUTE EXPOSURE
Immediate

CO-EXPOSURE CONCERNS
Acids
Ammonia
Other alkalies
THERMAL DECOMPOSITION PRODUCTS INCLUDE
Chlorine
Oxygen

MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE
Respiratory disorders
Gastrointestinal disorders
Skin disorders

DECONTAMINATION
- Wear positive-pressure SCBA and protective equipment specified by references such as the DOT Emergency Response Guidebook or the CANUTEC Initial Emergency Response Guide. If special chemical protective clothing is required, consult the chemical manufacturer or specific protective clothing compatibility charts.
- Delay entry until trained personnel and proper protective equipment are available.
- Remove patient from contaminated area.
- Quickly remove and isolate patient’s clothing, jewelry, and shoes.
- Gently brush away dry particles and blot excess liquids with absorbent material.
- Rinse patient with warm water, 30° C/86° F, if possible.
- Wash patient with Tincture of Green soap or a mild liquid soap and large quantities of water.
- Refer to decontamination protocol in Section Three.

IMMEDIATE FIRST AID
- Ensure that adequate decontamination has been carried out.
- If victim is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask as trained. Perform CPR if necessary.
- Immediately flush contaminated eyes with gently flowing water.
- Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration.
- Keep victim quiet and maintain normal body temperature.
- Obtain medical attention.

BASIC TREATMENT
- Establish a patent airway. Suction if necessary.
- Watch for signs of respiratory insufficiency and assist ventilations if necessary.
- Administer oxygen by nonrebreather mask at 10 to 15 L/min.
- Monitor for pulmonary edema and treat if necessary (refer to pulmonary edema protocol in Section Three).
- Monitor for shock and treat if necessary (refer to shock protocol in Section Three).
- Anticipate seizures and treat if necessary (refer to seizure protocol in Section Three).
- For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport (refer to eye irrigation protocol in Section Three).
- Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool (refer to ingestion protocol in Section Three).
- Do not attempt to neutralize.
ADVANCED TREATMENT

- Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious or in respiratory arrest. Early intubation, at the first signs of upper airway obstruction, may be necessary.
- Positive-pressure ventilation techniques with a bag-valve-mask device may be beneficial.
- Monitor cardiac rhythm and treat arrhythmias if necessary (refer to cardiac protocol in Section Three).
- Start an IV with D5W TKO. Use lactated Ringer’s if signs of hypovolemia are present. Watch for signs of fluid overload.
- Consider drug therapy for pulmonary edema (refer to pulmonary edema protocol in Section Three).
- For hypotension with signs of hypovolemia, administer fluid cautiously. Consider vasoressors if hypotensive with a normal fluid volume. Watch for signs of fluid overload (refer to shock protocol in Section Three).
- Treat seizures with diazepam (Valium) (refer to diazepam protocol in Section Four).
- Use proparacaine hydrochloride to assist eye irrigation (refer to proparacaine hydrochloride protocol in Section Four).

INITIAL EMERGENCY DEPARTMENT CONSIDERATIONS

- Useful initial laboratory studies include complete blood count, serum electrolytes, blood urea nitrogen (BUN), creatinine, glucose, urinalysis, and baseline biochemical profile, including serum aminotransferases (ALT and AST), calcium, phosphorus, and magnesium. Determination of the anion gap may be helpful. Arterial blood gases (ABGs), chest radiograph, and electrocardiogram may be required.
- Positive end-expiratory pressure (PEEP)-assisted ventilation may be necessary in patients with acute parenchymal injury who develop pulmonary edema or adult respiratory distress syndrome.
- Products may cause acidosis; hyperventilation and sodium bicarbonate may be beneficial. Bicarbonate therapy should be guided by clinical presentation, ABG determination, and serum electrolyte considerations.
- Bronchospastic symptoms should be treated with an inhalation medication regime similar to that used for reactive airways disease. Inhaled corticosteroids may be of value in severe bronchospasm.
- Endoscopy may be required for evaluation of oral ingestion.
- Obtain toxicological consultation as necessary.

SPECIAL CONSIDERATIONS

- Sodium hypochlorite preparations (less than 5% concentration) rarely cause problems (dermal and mucosal burns or metabolic acidosis). More concentrated (15% to 20%) sodium hypochlorite products may cause severe burns and hyperchloremia metabolic acidosis. Calcium hypochlorite (5% concentration) is more than twice as toxic as the equivalent concentration sodium hypochlorite solution.
SUBSTANCE IDENTIFICATION
A clear, colorless, fuming, oily liquid or white crystalline solid with an ammonia-like odor. Used as a rocket fuel, in chemical and pharmaceutical production and as a catalyst, as an inorganic solvent, and in plastic synthesis. The hydrate form is used as a reducing agent and is a strong base.

ROUTES OF EXPOSURE
Skin and eye contact
Inhalation
Ingestion
Skin absorption

TARGET ORGANS
Primary
Skin
Eyes
Central nervous system
Respiratory system
Blood
Secondary
Cardiovascular system
Gastrointestinal system
Hepatic
Renal
Metabolism

LIFE THREAT
Seizures, red blood cell destruction, pulmonary edema.

SIGNS AND SYMPTOMS BY SYSTEM
Cardiovascular: Hypotension
Respiratory: Irritation of respiratory mucosa, coughing, dyspnea, pulmonary edema, and respiratory failure.
CNS: Headache, dizziness, narcosis (CNS depression), muscle tremors, and seizures.
Gastrointestinal: Irritation of the GI tract, nausea, and vomiting (possibly with blood).
Eye: Conjunctivitis, corneal damage, and chemical burns.
Skin: Irritant dermatitis and chemical burns. Facial edema may be noted. Prolonged contact may result in allergic sensitization.
Renal: Kidney damage.
Hepatic: Liver damage.
Metabolism: Hyperglycemia or hypoglycemia.
Blood: Red blood cell hemolysis, methemoglobinemia from exposure to monomethyl-hydrazine.
Other: Some products present a human carcinogenic risk.
SYMPTOM ONSET FOR ACUTE EXPOSURE
Immediate
Some symptoms such as methemoglobinemia and pulmonary edema possibly delayed

CO-EXPOSURE CONCERNS
Corrosives
Methemoglobin formers

THERMAL DECOMPOSITION PRODUCTS INCLUDE
Ammonia
Carbon dioxide
Carbon monoxide
Hydrogen
Nitrogen oxide

MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE
Nervous system disorders
Respiratory system disorders
Anemia

DECONTAMINATION
• Wear positive-pressure SCBA and protective equipment specified by references such as the DOT Emergency Response Guidebook or the CANUTEC Initial Emergency Response Guide. If special chemical protective clothing is required, consult the chemical manufacturer or specific protective clothing compatibility charts.
• Delay entry until trained personnel and proper protective equipment are available.
• Remove patient from contaminated area.
• Quickly remove and isolate patient's clothing, jewelry, and shoes.
• Gently brush away dry particles and blot excess liquids with absorbent material.
• Rinse patient with warm water, 30° C/86° F, if possible.
• Wash patient with Tincture of Green soap or a mild liquid soap and large quantities of water.
• Refer to decontamination protocol in Section Three.

IMMEDIATE FIRST AID
• Ensure that adequate decontamination has been carried out.
• If victim is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask as trained. Perform CPR if necessary.
• Immediately flush contaminated eyes with gently flowing water.
• Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) in order to maintain an open airway and prevent aspiration.
• Keep victim quiet and maintain normal body temperature.
• Obtain medical attention.

BASIC TREATMENT
• Establish a patent airway. Suction if necessary.
• Watch for signs of respiratory insufficiency and assist ventilations if necessary.
• Administer oxygen by nonrebreather mask at 10 to 15 L/min.
• Monitor for pulmonary edema and treat if necessary (refer to pulmonary edema protocol in Section Three).
• Monitor for shock and treat if necessary (refer to shock protocol in Section Three).
- Anticipate seizures and treat if necessary (refer to seizure protocol in Section Three).
- For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport (refer to eye irrigation protocol in Section Three).
- Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 mL of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal (refer to ingestion protocol in Section Three and activated charcoal protocol in Section Four).
- Cover skin burns with dry, sterile dressings after decontamination (refer to chemical burn protocol in Section Three).

**ADVANCED TREATMENT**

- Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious, has severe pulmonary edema, or is in respiratory arrest.
- Positive-pressure ventilation techniques with a bag-valve-mask device may be beneficial.
- Monitor cardiac rhythm and treat arrhythmias if necessary (refer to cardiac protocol in Section Three).
- Start an IV with D₅W TKO. Use lactated Ringer's if signs of hypovolemia are present.
- Consider drug therapy for pulmonary edema (refer to pulmonary edema protocol in Section Three).
- For hypotension with signs of hypovolemia, administer fluid cautiously. Consider vasopressors for hypotension with a normal fluid volume. Watch for signs of fluid overload (refer to shock protocol in Section Three).
- Treat seizures with diazepam (Valium) (refer to diazepam protocol in Section Four).
- Monitor for signs of hypoglycemia (decreased level of consciousness, tachycardia, pallor, dilated pupils, diaphoresis, and/or a dextrose strip or glucometer reading less than 50 mg/dl) and administer 50% dextrose if necessary. Draw blood sample before administration (refer to 50% dextrose protocol in Section Four).
- Administer 1% solution methylene blue if patient is symptomatic with severe hypoxia, cyanosis, and cardiac compromise not responding to oxygen. DIRECT PHYSICIAN ORDER ONLY (refer to methylene blue protocol in Section Four).
- Use proparacaine hydrochloride to assist eye irrigation (refer to proparacaine hydrochloride protocol in Section Four).

**INITIAL EMERGENCY DEPARTMENT CONSIDERATIONS**

- Useful initial laboratory studies include complete blood count, serum electrolytes, blood urea nitrogen (BUN), creatinine, bilirubin, glucose, urinalysis and baseline biochemical profile, including serum aminotransferases (ALT and AST), calcium, phosphorus, and magnesium. Arterial blood gases (ABGs), chest radiograph, and electrocardiogram may be required.
- Monitor methemoglobin levels in patients exposed to monomethylhydrazine. Treat with methylene blue if patient is symptomatic and/or has a blood methemoglobin level greater than 30% (refer to methylene blue protocol in Section Four).
- Positive end-expiratory pressure (PEEP)-assisted ventilation may be necessary in patients with acute parenchymal injury who develop pulmonary edema or adult respiratory distress syndrome.
- Pyridoxine (vitamin B₆) has been used to treat intractable seizures associated with monomethylhydrazine poisoning. Adult intravenous pyridoxine dosage: 25 mg/kg. If
symptoms do not remit or reoccur, this dose may be repeated one time. Maximum total dosage not to exceed 5 g.
• Obtain toxicological consultation as necessary.
Aromatic Hydrocarbons and Related Compounds

SUBSTANCE IDENTIFICATION
Colorless, clear liquids with a faint etherlike or pleasant odor. Found in solvents, degreasers, wetting agents, agricultural chemicals, laboratory reagents, and antifreezes. Also used in the application and manufacture of varnishes, lacquers, paints, and detergents. May be an ingredient in gasoline and aviation fuel. Refer to guideline 25 for benzene management.

ROUTES OF EXPOSURE
Skin and eye contact
Inhalation
Ingestion
Skin absorption

TARGET ORGANS
Primary
Skin
Eyes
Central nervous system
Renal
Hepatic
Secondary
Cardiovascular system
Respiratory system
Metabolism

LIFE THREAT
Arrhythmias, respiratory failure, pulmonary edema, and paralysis. May also cause brain and kidney damage.

SIGNS AND SYMPTOMS BY SYSTEM
Cardiovascular: Cardiovascular collapse, tachyarrhythmias, especially ventricular fibrillation. Bradycardia has also been reported
Respiratory: Upper respiratory tract irritation, acute pulmonary edema, bronchospasm, dyspnea, tachypnea, respiratory failure, cough, hoarseness, and substernal chest pain.
CNS: Headache, drowsiness, dizziness, confusion, weakness, tremors, poor coordination, ataxia, seizures, CNS depression, coma, and disturbances in hearing and tinnitus. Patients may develop a transient euphoria after exposure.
Gastrointestinal: Nausea, vomiting, stomach pain, and excessive salivation.
Eye: Chemical conjunctivitis, corneal burns, and photophobia.
Skin: Drying and cracking of the skin, irritant dermatitis.
Renal: Hematuria, proteinuria, renal tubular acidosis, and renal failure.
Hepatic: Liver damage.
Metabolism: Metabolic acidosis.
Other: Human teratogenic risk: toluene. Refer to guideline 25 for benzene management.
SYMPTOM ONSET FOR ACUTE EXPOSURE
Immediate
Pulmonary edema possibly delayed

CO-EXPOSURE CONCERNS
Ethanol
Other organic solvents

THERMAL DECOMPOSITION PRODUCTS INCLUDE
Carbon dioxide
Carbon monoxide
Organic compounds

MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE
Central nervous system disorders
Respiratory disorders
Skin and eye disorders
Liver disorders
Kidney disorders

DECONTAMINATION
- Wear positive-pressure SCBA and protective equipment specified by references such as the DOT Emergency Response Guidebook or the CANUTEC Initial Emergency Response Guide. If special chemical protective clothing is required, consult the chemical manufacturer or specific protective clothing compatibility charts.
- Delay entry until trained personnel and proper protective equipment are available.
- Remove patient from contaminated area.
- Quickly remove and isolate patient's clothing, jewelry, and shoes.
- Gently brush away dry particles and blot excess liquids with absorbent material.
- Rinse patient with warm water, 30°C/86°F, if possible.
- Wash patient with Tincture of Green soap or a mild liquid soap and large quantities of water.
- Refer to decontamination protocol in Section Three.

IMMEDIATE FIRST AID
- Ensure that adequate decontamination has been carried out.
- If victim is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask as trained. Perform CPR if necessary.
- Immediately flush contaminated eyes with gently flowing water.
- Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration.
- Keep victim quiet and maintain normal body temperature.
- Obtain medical attention.

BASIC TREATMENT
- Establish a patent airway. Suction if necessary.
- Watch for signs of respiratory insufficiency and assist ventilations if necessary.
- Administer oxygen by nonrebreather mask at 10 to 15 L/min.
- Monitor for pulmonary edema and treat if necessary (refer to pulmonary edema protocol in Section Three).
- Monitor for shock and treat if necessary (refer to shock protocol in Section Three).
Aromatic Hydrocarbons and Related Compounds

- For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport (refer to eye irrigation protocol in Section Three).
- Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal (refer to ingestion protocol in Section Three and activated charcoal protocol in Section Four).

ADVANCED TREATMENT

- Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious or in respiratory arrest.
- Positive-pressure ventilation techniques with a bag-valve-mask device may be beneficial.
- Monitor cardiac rhythm and treat arrhythmias if necessary (refer to cardiac protocol in Section Three).
- Start an IV with D$_5$W TKO. Use lactated Ringer's if signs of hypovolemia are present. Watch for signs of fluid overload.
- Consider drug therapy for pulmonary edema (refer to pulmonary edema protocol in Section Three).
- Treat seizures with diazepam (Valium) (refer to diazepam protocol in Section Four).
- Use proparacaine hydrochloride to assist eye irrigation (refer to proparacaine hydrochloride protocol in Section Four).

INITIAL EMERGENCY DEPARTMENT CONSIDERATIONS

- Useful initial laboratory studies include complete blood count, serum electrolytes, blood urea nitrogen (BUN), creatinine, glucose, urinalysis, and baseline biochemical profile, including serum aminotransferases (ALT and AST), calcium, phosphorus, and magnesium. Determination of the anion gap may be helpful. Arterial blood gases (ABGs), chest radiograph, and electrocardiogram may be required.
- Positive end-expiratory pressure (PEEP)-assisted ventilation may be necessary in patients with acute parenchymal injury who develop pulmonary edema or adult respiratory distress syndrome.
- Severe exposure may cause acidosis; hyperventilation and sodium bicarbonate may be beneficial. Bicarbonate therapy should be guided by patient presentation, ABG determination, and serum electrolyte considerations.
- Obtain toxicological consultation as necessary.

SPECIAL CONSIDERATIONS

- Avoid epinephrine and related beta agonists (unless patient is in cardiac arrest or has reactive airways disease refractory to other treatment) because of the possible irritable condition of the myocardium. Use of these medications may lead to ventricular fibrillation.
- Chronic exposure/inhalation abuse such as glue (toluene) sniffing produces CNS excitation followed by depression and visual and auditory disturbances. Decreased visual and color perception accuracy may be observed.
- Organic brain dysfunction known as the psycho-organic syndrome of solvents has been described in cases of chronic exposure. Neuroencephalopathy (dementia) may occur as a sequelae of severe exposures. Permanent neurobehavioral changes may result.