

Sulfur Dioxide (SO₂)

CAS 7446-09-5; UN 1079

Synonyms include sulfur oxide, sulfurous acid anhydride, sulfurous anhydride, and sulfurous oxide.

- **Persons exposed only to sulfur dioxide gas pose no risk of secondary contamination. Persons whose skin or clothing is contaminated with liquid sulfur dioxide can secondarily contaminate rescuers by direct contact or through off-gassing of vapor.**
- **At room temperature, sulfur dioxide is a nonflammable, colorless gas that is heavier than air. Its strong, pungent odor and irritating properties usually provide adequate warning of its presence.**
- **Sulfur dioxide is readily absorbed through the upper respiratory tract; no data were located regarding dermal absorption. Sulfur dioxide is present in some foods; therefore, oral ingestion, although insignificant, is possible.**

Description

At room temperature, sulfur dioxide is a nonflammable, colorless gas with a very strong, pungent odor. Most people can smell sulfur dioxide at levels of 0.3 to 1 ppm. It is handled and transported as a liquefied compressed gas. It easily dissolves in water. The liquid is heavier than water. Although sulfur dioxide does not burn in air, cylinders of compressed liquid can explode in the heat of a fire.

Routes of Exposure

Inhalation

Inhalation is the major route of exposure to sulfur dioxide. The odor threshold is 5 times lower than the OSHA PEL (5 ppm). Most exposures are due to air pollution, and this has both short-term and chronic health consequences for people with lung disease. Inhaled sulfur dioxide readily reacts with the moisture of mucous membranes to form sulfurous acid (H₂SO₃), which is a severe irritant. People with asthma can experience increased airway resistance with sulfur dioxide concentrations of less than 0.1 ppm when exercising. Healthy adults experience increased airway resistance at 5 ppm, sneezing and coughing at 10 ppm, and bronchospasm at 20 ppm. Respiratory protection is required for exposures at or above 20 ppm. Exposures of 50 to 100 ppm may be tolerated for more than 30 to 60 minutes, but higher or longer exposures can cause death from airway obstruction. Sulfur dioxide is heavier than air; thus, exposure in poorly ventilated, enclosed, or low-lying areas can result in asphyxiation.

Children exposed to the same levels of sulfur dioxide as adults may receive a larger dose because they have greater lung surface

area:body weight ratios and increased minute volumes:weight ratios. In addition, they may be exposed to higher levels than adults in the same location because of their short stature and the higher levels of sulfur dioxide found nearer to the ground and because they are slow to leave the site of an exposure.

Skin/Eye Contact

Exposures of 10 to 20 ppm cause irritation to mucous membranes. Direct contact with escaping compressed gas or liquid sulfur dioxide can produce severe corneal damage and frostbite injury to the skin. No data were located regarding dermal absorption.

Ingestion

Ingestion of sulfur dioxide is unlikely because it is a gas at room temperature. Sulfur dioxide is used in small amounts as a food and wine preservative. Highly sensitive asthmatic individuals can develop bronchospasm after eating foods or drinking wine preserved with sulfur dioxide or other sulfur preservatives.

Sources/Uses

Sulfur dioxide gas is released primarily from the combustion of fossil fuels (75% to 85% of the industrial sources), the smelting of sulfide ores, volcanic emissions, and several other natural sources. It is a U.S. Environmental Protection Agency (EPA) priority air pollutant, but has many industrial and agricultural uses. It is sometimes added as a warning marker and fire retardant to liquid grain fumigants. Approximately 300,000 tons are used each year to manufacture hydrosulfites and other sulfur-containing chemicals (40%); to bleach wood pulp and paper (20%); to process, disinfect, and bleach food (16%); for waste and water treatment (10%); in metal and ore refining (6%); and in oil refining (4%). Toxic amounts of sulfur dioxide can be released from the preservative chemical metabisulfite in the presence of water and acid.

Standards and Guidelines

OSHA PEL (permissible exposure limit) = 5 ppm (averaged over an 8-hour workshift)

NIOSH IDLH (immediately dangerous to life or health) = 100 ppm

AIHA ERPG-2 (maximum airborne concentration below which it is believed that nearly all persons could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action) = 3 ppm

Physical Properties

Description: colorless gas at room temperature, colorless liquid when pressurized or cooled.

Warning properties: pungent odor is usually adequate to warn of acute exposure. Most people can detect sulfur dioxide at levels of 1 to 3 ppm (1 ppm is equivalent to 2.62 mg/m³).

Molecular weight: 64.06 daltons

Boiling point (760 mm Hg): 14.0 °F (-10.0 °C)

Freezing point: -99.4 °F (-72.7 °C)

Vapor pressure: 2,538 mm Hg at 70.0°F (21.1 °C)

Vapor density: 1.43 g/mL (water = 1.00)

Water solubility: soluble in water (11.3 g/100 mL at 68 °F [20 °C])

Flammability: nonflammable

Incompatibilities

Sulfur dioxide dissolves in water or steam to form sulfurous acid. Liquid sulfur dioxide corrodes iron, brass, copper, and some forms of plastic and rubber. Many metals, including zinc, aluminum, cesium, and iron, incandesce and/or ignite in unheated sulfur dioxide. Sulfur dioxide reacts explosively when it comes in contact with sodium hydride. Sulfur dioxide ignites when it is mixed with lithium acetylene carbide diamino or lithium acetylide ammonia.

Health Effects

- **Sulfur dioxide is severely irritating to the eyes, mucous membranes, skin, and respiratory tract. Bronchospasm, pulmonary edema, pneumonitis, and acute airway obstruction can occur.**
- **Inhalation exposure to very low concentrations of sulfur dioxide can aggravate chronic pulmonary diseases, such as asthma and emphysema. Certain highly sensitive asthmatics may develop bronchospasm when exposed to sulfur dioxide or sulfite-preserved foods.**
- **Sulfur dioxide reacts with water in the upper airway to form hydrogen, bisulfite, and sulfite, all of which induce irritation. As a result, reflex bronchoconstriction increases airway resistance.**

Acute Exposure

Sulfur dioxide dissolves in the moisture on skin, eyes, and mucous membranes to form sulfurous acid, an irritant and inhibitor of mucociliary transport. Most of the inhaled sulfur dioxide is detoxified by the liver to sulfates and excreted in the urine. The bisulfite ion produced when sulfur dioxide reacts with water is likely to be the main initiator of sulphur dioxide-induced bronchoconstriction.

Children do not always respond to chemicals in the same way that adults do. Different protocols for managing their care may be needed.

Respiratory

Sulfur dioxide respiratory irritation induces symptoms such as sneezing, sore throat, wheezing, shortness of breath, chest tightness, and a feeling of suffocation. Reflex laryngeal spasm and edema can cause acute airway obstruction. Bronchospasm, pneumonitis, and pulmonary edema can occur.

Some individuals are very susceptible to the presence of sulfur dioxide and overreact to concentrations which, in most people, elicit a much milder response. This hyperreactive response occurs the first time the individual is exposed and is therefore not an acquired immune or “hypersensitivity” response.

Acclimatization (a physiological adjustment of the individual to environmental changes) may also occur in up to 80% of exposed individuals. This is not necessarily beneficial although exposure may become less subjectively objectionable upon continuous or repeated exposure.

Asthmatics who are sensitive to sulfites in food can develop bronchospasm or an anaphylactoid reaction. Sulfur dioxide, along with other components of air pollution, can exacerbate chronic cardiopulmonary disease.

Exposure to high concentrations of sulfur dioxide can lead to Reactive Airway Dysfunction Syndrome (RADS), a chemically- or irritant-induced type of asthma.

Children may be more vulnerable to corrosive agents than adults because of the relatively smaller diameter of their airways. Children also may be more vulnerable because of relatively increased minute ventilation per kg and failure to evacuate an area promptly when exposed.

Dermal Sulfur dioxide is a severe skin irritant causing stinging pain, redness, and blisters, especially on mucous membranes. Skin contact with escaping compressed gas or liquid sulfur dioxide can cause frostbite and irritation injury.

Because of their relatively larger surface area: body weight ratio, children are more vulnerable to toxicants that affect the skin.

Ocular Conjunctivitis and corneal burns can result from the irritant effect of sulfur dioxide vapor or escaping compressed gas, and from direct exposure to the liquid.

Gastrointestinal Nausea, vomiting, and abdominal pain have been reported after inhalation exposure to moderate to high doses of sulfur dioxide.

Potential Sequelae High-level acute exposures have resulted in pulmonary fibrosis, chronic bronchitis, and chemical bronchopneumonia with bronchiolitis obliterans. Bronchospasm can be triggered in individuals who have underlying lung disease, especially those who have asthma and emphysema. Rarely, new onset airway hyperreactivity, known as reactive airways dysfunction syndrome (RADS), develops in patients without prior bronchospasm.

Chronic Exposure

Chronic exposure can result in an altered sense of smell (including increased tolerance to low levels of sulfur dioxide), increased susceptibility to respiratory infections, symptoms of chronic bronchitis, and accelerated decline in pulmonary function. Chronic exposure may be more serious for children because of their potential longer life span.

Carcinogenicity

The International Agency for Research on Cancer (IARC) assigned sulfur dioxide to Group 3, not classifiable as to its carcinogenicity to humans.

*Reproductive and
Developmental Effects*

Sulfur dioxide is not included in *Reproductive and Developmental Toxicants*, a 1991 report published by the U.S. General Accounting Office (GAO) that lists 30 chemicals of concern because of widely acknowledged reproductive and developmental consequences. There are no known reproductive or developmental effects of sulfur dioxide alone by any route of exposure. There is no conclusive evidence that sulfur dioxide is a genotoxin in humans.

Prehospital Management

- **Persons exposed only to sulfur dioxide gas pose no risk of secondary contamination to rescuers. Persons whose skin or clothing is contaminated with liquid sulfur dioxide can secondarily contaminate response personnel by direct contact or through off-gassing of vapor.**
- **Sulfur dioxide is severely irritating to the eyes, mucous membranes, skin, and respiratory tract. Exposure to high levels can cause pulmonary edema, bronchial inflammation and laryngeal spasm and edema with possible airway obstruction.**
- **There is no antidote for sulfur dioxide. Treatment consists of support of respiratory and cardiovascular functions.**

Hot Zone

Rescuers should be trained and appropriately attired before entering the Hot Zone. If the proper equipment is not available, or if the rescuers have not been trained in its use, call for assistance from a local or regional hazardous materials (HAZMAT) team or other properly equipped response organization.

Rescuer Protection

Inhaled sulfur dioxide vapor is readily absorbed and is a potent respiratory tract irritant, causing mild irritation even at low doses. Escaping compressed gas or liquid sulfur dioxide on the skin or eyes can cause frostbite injury and irritation. Dermal absorption is negligible.

Respiratory protection: Positive-pressure, self-contained breathing apparatus (SCBA) is recommended in response situations that involve exposure to potentially unsafe levels of sulfur dioxide gas.

Skin protection: Fully encapsulated chemical-protective clothing is recommended because sulfur dioxide can cause skin irritation and burns.

ABC Reminders

Quickly access for a patent airway, ensure adequate respiration and pulse. Maintain adequate circulation. Provide supplemental oxygen if cardiopulmonary compromise is suspected. If trauma is suspected, manually maintain cervical immobilization and apply a cervical collar and a backboard when feasible. Apply direct pressure to stop any heavy bleeding.

Victim Removal

If victims can walk, lead them out of the Hot Zone to the Decontamination Zone. Victims who are unable to walk should be removed on backboards or gurneys. If these are not available, carefully carry or drag victims to safety.

Consider appropriate management of chemically contaminated children, such as measures to reduce separation anxiety if a child is separated from a parent or other adult.

Decontamination Zone

Patients exposed only to sulfur dioxide gas who have no eye or skin irritation do not need decontamination. They may be transferred immediately to the Support Zone. Other patients will require decontamination as described below.

Rescuer Protection

If exposure levels are determined to be safe, decontamination may be conducted by personnel wearing a lower level of protection than that required in the Hot Zone (described above).

ABC Reminders

Quickly access for a patent airway, ensure adequate respiration and pulse. Maintain adequate circulation. Provide supplemental oxygen if cardiopulmonary compromise is suspected. If trauma is suspected, manually maintain cervical immobilization and apply a cervical collar and a backboard when feasible. Administer supplemental oxygen as required. Assist ventilation with a bag-valve-mask device if necessary. Apply direct pressure to control any heavy bleeding.

Basic Decontamination

Rapid skin decontamination is critical. Victims who are able may assist with their own decontamination. Remove contaminated clothing and personal belongings and place them in double plastic bags.

Gently wash exposed skin and hair with copious amounts of water (preferably under a shower). Use caution to avoid hypothermia when decontaminating children or the elderly. Use blankets or warmers when appropriate.

Irrigate exposed eyes with plain water or saline for at least **5 minutes**. Remove contact lenses if they are easily removable without additional trauma to the eye. If pain or injury is evident, continue irrigation while transferring the victim to the Support Zone.

Consider appropriate management of chemically contaminated children at the exposure site. Also, provide reassurance to the child during decontamination, especially if separation from a parent occurs. If possible, seek assistance from a child separation expert.

Transfer to Support Zone

As soon as basic decontamination is complete, move the victim to the Support Zone.

Support Zone

Be certain that victims have been decontaminated properly (see *Decontamination Zone*, above). Victims who have undergone decontamination or have been exposed only to sulfur dioxide gas pose no serious risk of secondary contamination to rescuers. In such cases, Support Zone personnel require no specialized protective gear.

ABC Reminders

Quickly access for a patent airway. If trauma is suspected, maintain cervical immobilization manually and apply a cervical collar and a backboard when feasible. Ensure adequate respiration and pulse. Administer supplemental oxygen as required and establish intravenous access if necessary. Place on a cardiac monitor.

Additional Decontamination

Continue irrigating exposed skin and eyes, as appropriate.

Advanced Treatment

In cases of respiratory compromise secure airway and respiration via endotracheal intubation. If not possible, perform cricothyroidotomy if equipped and trained to do so.

Treat patients who have bronchospasm with aerosolized bronchodilators. The use of bronchial sensitizing agents in situations of multiple chemical exposures may pose additional risks. Consider the health of the myocardium before choosing which type of bronchodilator should be administered. Cardiac sensitizing agents may be appropriate; however, the use of cardiac sensitizing agents after exposure to certain chemicals may pose enhanced risk of cardiac arrhythmias (especially in the elderly). Sulfur dioxide poisoning is not known to pose additional risk during the use of bronchial or cardiac sensitizing agents.

Consider racemic epinephrine aerosol for children who develop stridor. Dose 0.25–0.75 mL of 2.25% racemic epinephrine solution in 2.5 cc water, repeat every 20 minutes as needed, cautioning for myocardial variability.

Patients who are comatose, hypotensive, or having seizures or cardiac arrhythmias should be treated according to advanced life support (ALS) protocols.

If evidence of shock or hypotension is observed begin fluid administration. For adults, bolus 1,000 mL/hour intravenous saline or lactated Ringer's solution if blood pressure is under 80 mm Hg; if systolic pressure is over 90 mm Hg, an infusion rate of 150 to 200 mL/hour is sufficient. For children with compromised perfusion administer a 20 mL/kg bolus of normal saline over 10 to 20 minutes, then infuse at 2 to 3 mL/kg/hour.

Transport to Medical Facility

Only decontaminated patients or patients not requiring decontamination should be transported to a medical facility. “Body bags” are not recommended.

Report the condition of the patient, treatment given, and estimated time of arrival at the medical facility to the base station and the receiving medical facility.

Multi-Casualty Triage

Consult with the base station physician or the regional poison control center for advice regarding triage of multiple victims.

Patients who have histories or evidence suggesting significant exposure (e.g., severe or persistent cough or dyspnea, or chemical burns) should be transported to a medical facility for evaluation. Patients who have a history of chronic pulmonary disease should be clinically evaluated for airflow obstruction.

Patients who have symptoms of mild or transient skin, nose, or eye irritation may be discharged from the scene after their names, addresses, and telephone numbers are recorded. They should be advised to rest and to seek medical care promptly if symptoms develop or recur (see *Patient Information Sheet* below).

Emergency Department Management

- **Persons exposed only to sulfur dioxide gas pose no risk of secondary contamination to rescuers. Persons whose skin or clothing is contaminated with liquid sulfur dioxide can secondarily contaminate response personnel by direct contact or through off-gassing of vapor.**
- **Sulfur dioxide is a severe irritant to the respiratory tract, eyes, mucous membranes, and skin. Exposure to high doses can cause pulmonary edema, bronchial inflammation, and laryngeal spasm and edema with possible airway obstruction.**
- **There is no antidote for sulfur dioxide. Treatment consists of support of respiratory and cardiovascular functions.**

Decontamination Area

Previously decontaminated patients and those exposed only to sulfur dioxide gas who have no skin or eye irritation may be transferred immediately to the Critical Care Area. Others require decontamination as described below.

Be aware that use of protective equipment by the provider may cause fear in children, resulting in decreased compliance with further management efforts.

Emergency room personnel should examine children's mouth because of the frequency of hand-to-mouth activity among children.

ABC Reminders

Evaluate and support the airways, breathing, and circulation. Children may be more vulnerable to corrosive agents than adults because of the relatively smaller diameter of their airways. Provide supplemental oxygen if cardiopulmonary compromise is suspected. In cases of respiratory compromise secure airway and respiration via endotracheal intubation. If not possible, surgically create an airway.

Treat patients who have bronchospasm with aerosolized bronchodilators. The use of bronchial sensitizing agents in situations of multiple chemical exposures may pose additional risks. Consider the health of the myocardium before choosing which type of bronchodilator should be administered. Cardiac sensitizing agents may be appropriate; however, the use of cardiac sensitizing agents after exposure to certain chemicals may pose enhanced risk of cardiac arrhythmias (especially in the elderly). Sulfur dioxide poisoning is not known to pose additional risk during the use of bronchial or cardiac sensitizing agents.

Consider racemic epinephrine aerosol for children who develop stridor. Dose 0.25–0.75 mL of 2.25% racemic epinephrine solution in 2.5 cc water, repeat every 20 minutes as needed, cautioning for myocardial variability.

Patients who are comatose, hypotensive, or are having seizures or cardiac arrhythmias should be treated in the conventional manner.

Basic Decontamination

Patients who are able may assist with their own decontamination.

Because sulfur dioxide can cause burns, ED staff should don chemical-resistant jumpsuits (e.g., of Tyvek or Saranex) or butyl rubber aprons, rubber gloves, and eye protection if the patient's clothing or skin is wet. After the patient has been decontaminated, no special protective clothing or equipment is required for ED personnel.

Quickly remove contaminated clothing while gently washing the skin with water (preferably under a shower). Double-bag the contaminated clothing and personal belongings. Sulfur dioxide reacts with body moisture to form sulfurous and sulfuric acids; therefore, chemical burns are likely. Handle burned skin with caution.

Flush exposed or irritated eyes with plain water or saline for at least **5 minutes**. Remove contact lenses if easily removable without additional trauma to the eye. If pain or injury is evident, continue irrigation while transferring the victim to the Critical Care Area. An ophthalmic anesthetic, such as 0.5% tetracaine, might be necessary to alleviate blepharospasm, and lid retractors might be required to allow adequate irrigation under the eyelids.

Critical Care Area

Be certain that appropriate decontamination has been carried out (see *Decontamination Area*, above).

ABC Reminders

Evaluate and support the airways, breathing, and circulation as in *ABC Reminders* above. Children may be more vulnerable to corrosive agents than adults because of the relatively smaller diameter of their airways. Establish intravenous access in seriously ill patients. Continuously monitor cardiac rhythm.

Patients who are comatose, hypotensive, or are having seizures or cardiac arrhythmias should be treated in the conventional manner.

Inhalation Exposure

Administer supplemental oxygen by mask to patients who have respiratory complaints. Treat patients who have bronchospasm with aerosolized bronchodilators. The use of bronchial sensitizing agents in situations of multiple chemical exposures may pose additional risks. Consider the health of the myocardium before choosing which type of bronchodilator should be administered. Cardiac sensitizing agents may be appropriate; however, the use of cardiac sensitizing agents after exposure to certain chemicals may pose enhanced risk of cardiac arrhythmias (especially in the elderly). Sulfur dioxide poisoning is not known to pose additional risk during the use of bronchial or cardiac sensitizing agents.

Consider racemic epinephrine aerosol for children who develop stridor. Dose 0.25–0.75 mL of 2.25% racemic epinephrine solution in 2.5 cc water, repeat every 20 minutes as needed, cautioning for myocardial variability.

Use of steroids to prevent or treat chemical pneumonitis and pulmonary edema is controversial. Antibiotics should be used as indicated to control infection. Damaged lower respiratory tissue might be more susceptible to infection.

Skin Exposure

Escaping compressed gas or liquid sulfur dioxide can cause frostbite. If frostbite is present, treat affected areas by rewarming in a water bath at a temperature of 104 to 107.6 °F (40 to 42 °C) for 20 to 30 minutes and continue until a flush has returned to the affected area. If chemical burns are present, treat as thermal burns.

Because of their relatively larger surface area:body weight ratio, children are more vulnerable to toxicants that affect the skin.

Eye Exposure

Continue irrigation for at least 15 minutes or until the pH of the conjunctival fluid has returned to normal. Test visual acuity. Examine the eyes for conjunctival or corneal damage and treat appropriately. Immediately consult an ophthalmologist for patients who have suspected severe corneal injuries.

*Antidotes and
Other Treatments*

There is no antidote for sulfur dioxide. Treatment is supportive of respiratory function.

Laboratory Tests

Routine laboratory studies include chest radiography and pulse oximetry (or ABG measurements).

**Disposition and
Follow-up**

Consider hospitalizing symptomatic patients who have evidence of respiratory distress or significant skin burns.

Pulmonary injury might continue to evolve over 18 to 24 hours. Patients exposed by inhalation who are initially symptomatic should be observed carefully and reexamined periodically. Patients who develop pulmonary edema should be admitted to an intensive care unit.

Delayed Effects

Reactive airways dysfunction syndrome (RADS) is a non-immune-mediated asthma-like syndrome that can develop after exposure to sulfur dioxide. Once established, this non-specific bronchial hyperreactivity might diminish over a few weeks or persist for years. Bronchospasm might be triggered in people who have chronic pulmonary diseases, such as asthma and emphysema.

Patient Release

Patients who become totally asymptomatic in terms of pulmonary complaints in a 6- to 8-hour observation period are not likely to develop complications. They may be released and advised to rest and to seek medical care promptly if symptoms develop (see the *Sulfur Dioxide—Patient Information Sheet* below). Cigarette smoking can exacerbate pulmonary injury and should be discouraged for 72 hours after exposure.

Follow-up

Obtain the name of the patient's primary care physician so that the hospital can send a copy of the ED visit to the patient's doctor.

Follow-up evaluation of respiratory function should be arranged for severely exposed patients. Patients who have skin or corneal lesions should be reexamined within 24 hours.

Reporting

If a work-related incident has occurred, you might be legally required to file a report; contact your state or local health department.

Other persons might still be at risk in the setting where this incident occurred. If the incident occurred in the workplace, discussing it with company personnel might prevent future incidents. If a public health risk exists, notify your state or local health department or other responsible public agency. When appropriate, inform patients that they may request an evaluation of their workplace from the Occupational Safety and Health Administration (OSHA) or the National Institute for Occupational Safety and Health (NIOSH).

Sulfur Dioxide (SO₂) Patient Information Sheet

This handout provides information and follow-up instructions for persons who have been exposed to sulfur dioxide.

What is sulfur dioxide?

Sulfur dioxide is a colorless gas that has a strong, stinging odor. It has many industrial and agricultural uses. Most sulfur dioxide comes from burning fossil fuels containing sulfur and is a major part of air pollution. It is shipped and handled as a compressed gas in a special container. Some foods and wines are preserved with small amounts of sulfur dioxide that are safe for most people.

What immediate health effects can be caused by exposure to sulfur dioxide?

Inhaling sulfur dioxide causes irritation to the nose, eyes, throat, and lungs. Typical symptoms include sore throat, runny nose, burning eyes, and cough. Inhaling high levels can cause swollen lungs and difficulty breathing. Skin contact with sulfur dioxide vapor can cause irritation or burns. Liquid sulfur dioxide is very cold and can severely injure the eyes or cause frostbite if it touches the skin. Some people with asthma who are sensitive to sulfites might have an asthma attack if they eat foods preserved with sulfur dioxide or other sulfur-containing chemicals.

Can sulfur dioxide poisoning be treated?

There is no antidote for sulfur dioxide, but its effects can be treated and most exposed persons recover completely. Persons who have inhaled large amounts of sulfur dioxide might need to be hospitalized.

Are any future health effects likely to occur?

A single, small exposure from which a person recovers quickly is not likely to cause delayed or long-term effects. After a serious exposure, damage to the lungs can occur, causing asthma, pneumonia, and bronchitis. Permanent damage to the lungs is possible.

What tests can be done if a person has been exposed to sulfur dioxide?

Specific tests for the presence of sulfur dioxide in blood or urine are not generally useful. If a severe exposure has occurred, blood analyses, x-rays, and breathing tests might show whether the lungs have been injured. Testing is not needed in every case.

Where can more information about sulfur dioxide be found?

If the exposure happened at work, you might be required to contact your employer and the Occupational Safety and Health Administration (OSHA).

Employees may request a Health Hazard Evaluation from the National Institute for Occupational Safety and health (NIOSH).

More information about sulfur dioxide can be obtained from your regional poison control center; your state, county, or local health department; the Agency for Toxic Substances and Disease Registry (ATSDR); your doctor; or a clinic in your area that specializes in occupational and environmental health. Ask the person who gave you this form for help locating these telephone numbers.

Follow-up Instructions

Keep this page and take it with you to your next appointment. Follow *only* the instructions checked below.

Call your doctor or the Emergency Department if you develop any unusual signs or symptoms within the next 24 hours, especially:

- eye, nose, throat irritation
- coughing or wheezing
- difficulty breathing or shortness of breath
- chest pain or tightness
- nausea, vomiting, diarrhea, or stomach pain

No follow-up appointment is necessary unless you develop any of the symptoms listed above.

Call for an appointment with Dr. _____ in the practice of _____.
When you call for your appointment, please say that you were treated in the Emergency Department at _____ Hospital by _____ and were advised to be seen again in _____ days.

Return to the Emergency Department/ _____ Clinic on (date) _____ at _____ AM/PM for a follow-up examination.

Do not perform vigorous physical activities for 1 to 2 days.

You may resume everyday activities including driving and operating machinery.

Do not return to work for _____ days.

You may return to work on a limited basis. See instructions below.

Avoid exposure to cigarette smoke for 72 hours; smoke may worsen the condition of your lungs.

Avoid drinking alcoholic beverages for at least 24 hours; alcohol may worsen injury to your stomach or have other effects.

Avoid taking the following medications: _____

You may continue taking the following medication(s) that your doctor(s) prescribed for you: _____

Other instructions: _____

- Provide the Emergency Department with the name and the number of your primary care physician so that the ED can send him or her a record of your emergency department visit.

- You or your physician can get more information on the chemical by contacting: _____
_____ or _____, or by checking out the following Internet
Web sites: _____; _____.

Signature of patient _____ Date _____

Signature of physician _____ Date _____