

The information in this brochure was reviewed by Government subject matter experts as well as by non-government experts to ensure its accuracy and completeness.

If you or your healthcare provider have questions about any of the information contained in this document, please see the references under More Information, contact your Military Health Service Primary Care Manager or Veterans Administration Primary Care Provider, or call the Army Public Health Center at 410-436-2714. We thank you for your service to our country and recognize the contributions and sacrifices that you made.

## >> More information

Army Public Health  
Center, Chemical Warfare  
Agents

[http://phc.amedd.army.mil/  
topics/envirohealth/em/  
Pages/CWA.aspx](http://phc.amedd.army.mil/topics/envirohealth/em/Pages/CWA.aspx)



Scan QR code to access Army  
Public Health Center, Chemical  
Warfare web page

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Agency for Toxic Substances and Disease Registry (ATSDR),  
Medical Management Guidelines for Blister Agents such as  
Sulfur Mustard Agent H or HD (C<sub>4</sub>H<sub>8</sub>Cl<sub>2</sub>S), Sulfur Mustard  
Agent HT

<http://www.atsdr.cdc.gov/mmg/mmg.asp?id=924&tid=191>

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Veterans Administration Office of Public Health, Military  
Exposures to Warfare Agents

[http://www.publichealth.va.gov/exposures/categories/  
warfare-agents.asp](http://www.publichealth.va.gov/exposures/categories/warfare-agents.asp)

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Centers for Disease Control and Prevention (CDC),  
Emergency Preparedness and Response - Facts About  
Sulfur Mustard

<http://www.bt.cdc.gov/agent/sulfurmustard/basics/facts.asp>



# Long-Term Effects of Exposure to Sulfur Mustard

SERVICE MEMBERS AND VETERANS

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All of the information in this brochure  
is considered accurate as of the time  
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## Introduction

Sulfur mustard (a blister agent), is one of the chemical warfare agents most commonly used in military conflicts around the world since World War II (WWII). Other blister agents are believed to behave very much like sulfur mustard.

Service members and Veterans who may have been exposed to sulfur mustard, commonly known as “mustard gas,” should know what to expect as a result of that exposure. If you were exposed, you can use the information in this brochure to make informed health choices with your healthcare team. If you are concerned about possible health effects from exposure, developing and maintaining an ongoing relationship with your healthcare provider is the best way to monitor changes in your health.

## Sulfur Mustard Exposure

### >> Eye Exposure

If you had an eye exposure to sulfur mustard requiring medical care for keratitis (inflammation of the cornea, the central front portion of the eye), for several months or more, beginning at the time of the exposure, you are likely to be at higher risk of recurrence of the keratitis. Keratitis may recur up to several decades after the exposure. [Note: There are no known cases of this level of eye exposure occurring in a combat zone among U.S. Military personnel since WWII.] Long-term risk has not been associated with mild exposure which resulted in tearing, itching, a gritty sensation, burning, mild reddening of the eyes, or mild eye pain.

#### What to consider:

- » If you had any level of eye exposure to sulfur mustard, practice good eye hygiene such as wearing sunglasses and using safety eyewear; see an eye doctor regularly.
- » If you had any level of eye exposure to sulfur mustard, see an eye care professional if you develop unexplained eye pain or visual changes; tell them of your exposure history.

- » If you had eye exposure to sulfur mustard that required 8 weeks or more of medical care for your eyes, including ophthalmologic care, report all diagnoses of keratitis to your Department of Defense (DOD), Veterans Affairs (VA), and Civilian healthcare providers, so that the information can be entered into your medical record.

### >> Lung Exposure

If you had a severe lung exposure to sulfur mustard, you have a high risk of long-term lung effects such as chronic bronchitis. This includes people who had inflamed upper and lower airways, tissue death of the airway lining, obstruction of the upper or lower airways, or pneumonia. People with such sulfur mustard exposures usually required intensive or moderate immediate medical care at the time of the exposure, were hospitalized as inpatients, and often required this medical care in an intensive care unit to prevent death. Exposures of this magnitude occurred during WWI. The Institute of Medicine concluded that studies of battlefield exposures to mustard from WWI are suggestive of an increased risk of lung cancer, but there are limitations to this conclusion. [Note: There are no known cases of this level of lung exposure occurring in a combat zone, among U.S. Military personnel, since WWII.]

If you had mild or symptom-free lung exposure, it is unclear whether long-term lung effects will occur. Mild sulfur mustard exposure may cause runny nose, sneezing, nosebleed, hoarseness progressing to “toneless” voice, barking cough, loss of taste and smell, and nasal or sinus pain (occurring later). Smokers or asthmatics may also experience wheezing, difficulty breathing, or shortness of breath with such mild exposures to mustard.

#### What to consider:

- » If you had any level of lung exposure to sulfur mustard, there is a possibility of long-term respiratory effects. Avoid lung toxins, especially tobacco smoke (including second-hand smoke).
- » If you had any level of lung exposure to sulfur mustard, establish and maintain a close,

ongoing relationship with a healthcare provider so that changes in your health are more likely to be detected.

- » If you had a clinically significant lung exposure, to sulfur mustard (i.e., an exposure that required medical intervention for your lung symptoms at the time of the exposure), you may have received a medical evaluation, including respiratory evaluation at baseline and a follow-up as directed by the medical specialist who conducted the evaluation. This may be a general medical examination which included an evaluation of your lungs. There are no special tests or exams specifically for sulfur mustard exposure. You should report all cases of respiratory symptoms or diagnoses to your DOD, VA, and Civilian healthcare providers, so that the information is entered into your medical records.
- » If you had mild symptoms or no symptoms following your inhalation exposure to sulfur mustard and you later develop respiratory symptoms, see your usual source of health care. Report all respiratory diagnoses to your DOD or VA healthcare provider so that the information is entered into your medical record.

### >> Skin Exposure

If you had no skin symptoms at the time of exposure to sulfur mustard, there is no evidence that skin symptoms will develop later. Most people who developed redness and swelling of the skin but not actual blisters after exposure to sulfur mustard, typically heal without scarring and without any long-term effects. Those who had blistering may have darker or lighter looking skin at the site of exposure and there are some rare reports of psoriasis. Sites previously injured by sulfur mustard exposure may be more easily injured by direct trauma even after apparent healing. There are reports of cancer developing at the edges of scars from severe burns resulting from exposure to sulfur mustard; although,

it is unclear if this happens any more often from sulfur mustard-related burn scars than from any other type of burn scar. There is no indication that people who had no symptoms immediately after sulfur mustard exposure are at any risk of subsequent skin effects including cancer.

#### What to consider:

- » If you had skin symptoms after exposure to sulfur mustard, you may have long-term skin effects. Avoid skin injuries, including sun and tanning booth-induced injuries to the affected skin.
- » If you had skin symptoms after exposure to sulfur mustard with scarring at the site of exposure-related skin burn, see a skin care professional if the scar begins to change color, shape, or texture. This might be an indication of the development of cancer.
- » If you had skin symptoms after exposure to sulfur mustard, report all diagnoses of cancer at the edges of your sulfur mustard exposure-related scars to your DOD, VA care, and Civilian healthcare providers so that the information is entered into your medical record.
- » Everyone, regardless of exposure, should avoid skin trauma, including sun and tanning-booth injuries.

### >> Internal Exposure

There is limited scientific or medical literature about the effect of sulfur mustard exposure on other body systems and tissues. A small amount (8%) of sulfur mustard is absorbed into the blood stream, so it's possible the sulfur mustard could affect the whole body. In people who had burns of greater than 36% of their body-surface area, severe eye injuries, or significant lung damage due to their sulfur mustard exposure, the production of blood cells in their bone marrow may be decreased. [Note: There are no known cases of this level of sulfur mustard exposure occurring in a combat zone, among U.S. military personnel since WWII.] Such bone marrow depression has not been found in people with lower levels of exposure.