

At least one study has shown that in individuals who experienced severe or moderate exposure to sarin nerve agents there may be changes to the gray and white matter of the brain volume 5-6 years later. This study was done on victims of the Tokyo subway sarin poisoning in 1995, all of whom were treated at hospital for sarin intoxication immediately after the exposure. The percentage reduction of cholinesterase levels on the day of the attack relative to the day of magnetic resonance imaging (MRI) scanning ranged from 42 to 81%. These MRI changes are linked to the reduced cholinesterase levels at the time of the exposure but not to the specific symptom, functional impact or impairment. The importance of abnormal MRI test results are not clear.

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

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

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

Agency for Toxic Substances and Disease Registry (ATSDR),
Medical Management Guidelines for Nerve Agents: Tabun
(GA); Sarin (GB); Soman (GD); and VX

<http://www.atsdr.cdc.gov/mmg/mmg.asp?id=523&tid=93>

Centers for Disease Control and Prevention (CDC),
Emergency Preparedness and Response, Facts About Sarin

<http://emergency.cdc.gov/agent/sarin/basics/facts.asp>

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 above or 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.

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All of the information in this brochure
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<http://phc.amedd.army.mil>
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Long-Term Effects of Exposure to Sarin

SERVICE MEMBERS AND VETERANS



Introduction

Sarin is a nerve agent and is one of the chemical warfare agents most commonly used in military conflicts around the world since World War II (WWII). Other nerve agents are believed to behave very much like sarin. Nerve agents work by chemically disabling normal controls over our muscles and glands throughout the body. A large dose of nerve agent may result in the rapid overstimulation of muscles and glands that could lead to death. This brochure provides information for Service members and Veterans on what to expect as a result of exposure to sarin. The information can be used to help make medical choices with your healthcare team.

Sarin Exposure

The short- and long-term effects of high levels of sarin nerve agent exposure are well known. High exposure levels require immediate medical attention, often in an intensive care unit to prevent death. Less is known about lower-level exposures (e.g., levels associated with mild or no symptoms). Sarin typically evaporates quickly and is an immediate but short-lived threat.

Levels of exposure are based on the initial symptoms (what the individual was feeling) and signs (what a doctor or other individual sees). Following a vapor exposure, the eyes, nose, and airways are affected first, within seconds to minutes of exposure. As the level of exposure increases, individuals may rapidly experience a cascade of severe symptoms and even quickly lose consciousness. **From the time these agents were developed in the 1930s to date, there are no known cases of moderate or severe levels of sarin exposure occurring in a combat zone among U.S. military personnel.**

>> Severe Exposure

- » Signs and symptoms of severe exposure are convulsions, loss of consciousness, extreme difficulty breathing, and/or muscle paralysis.
- » The exposed individual needs intensive medical care at the time of exposure to prevent death. Red blood cell cholinesterase activity is usually measured and found to be low. If there is no

further exposure, levels return to normal within 3-4 months and remain normal; so repeating the test years later is not indicated.

- » If you had a high level exposure to nerve agents you should have had a neurological evaluation shortly after your acute symptoms resolved to determine if there were any residual effects from your exposure and you should have received any follow-up care that your healthcare provider recommended.
- » There may be long-term abnormalities on neuropsychological, balance, and vision testing, even in those who are symptom-free at the time of follow-up testing.

>> Moderate Exposure

- » Signs and symptoms associated with moderate exposure to sarin nerve agents are: pinpoint pupils, runny nose, blurred vision, shortness of breath, sweat, drooling, nausea, vomiting, and lower cholinesterase level on blood testing. Symptoms may also rapidly progress to muscle twitching and confusion.
- » The exposed individual needs some medical care at the time of exposure but does not require intensive care or hospitalization. Red blood cell cholinesterase activity is usually measured and is often low, but these levels return to normal within 3-4 months. These values will remain normal and, therefore, there is no need to perform repeat testing years after a sarin nerve agent exposure.
- » If you had a moderate level exposure to sarin nerve agent, you should have had a neurological evaluation shortly after your acute symptoms resolved to determine if there were any residual effects from your exposure; you should have received any follow-up care that your healthcare provider recommended.
- » There may be long-term abnormalities on neuropsychological, balance, and vision testing, even in those who are symptom-free at the time of follow-up testing.

>> Minimal or Mild Exposure

- » Minimal to mild exposure causes pinpoint pupils, with or without runny nose, nausea and vomiting, or may cause no symptoms at all.
- » Minimal to mild exposure typically requires little, if any, medical care for associated symptoms at the time of exposure. Mild and isolated symptoms such as pinpoint pupils typically resolve quickly. Those who experience mild, minimal, or no symptoms at the time of the exposure are not expected to develop new symptoms and are not expected to develop any problems that affect their daily lives. In some cases, advanced tests of the brain may show abnormalities. The significance of these abnormalities is unknown; so such advanced brain testing should not be done outside of a research study.
- » When an individual with a possible exposure to sarin vapor only (no liquid exposure) shows no signs of exposure within 15 minutes, then it was not a clinically significant exposure. The effects of vapor exposure occur within seconds to minutes of the exposure.
- » To date, the vast majority of studies of humans exposed to sarin nerve agent indicate that following an exposure, no new symptoms will develop long after the exposure if there were no symptoms at the time of the nerve agent exposure.

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.