

## Landslides / Mudslides

*Landslides* occur when masses of rock, earth, or debris move down a slope. *Debris flows*, also known as *mudslides*, are a common type of fast-moving landslide that tends to flow in channels. Be aware of any sudden increase or decrease in water level on a stream or creek that might indicate debris flow upstream. A trickle of flowing mud may precede a larger flow.

- ▶ Look for tilted trees, telephone poles, fences, or walls, and for new holes or bare spots on hillsides.
- ▶ Listen for rumbling sounds that might indicate an approaching landslide or mudflow.
- ▶ Be alert when driving. Roads may become blocked or closed due to collapsed pavement or debris.
- ▶ If landslide or debris flow danger is imminent, quickly move away from the path of the slide. Getting out of the path of a debris flow is your best protection. Move to the nearest high ground in a direction away from the path.
- ▶ Stay away from the site. Flooding or additional slides may occur after a landslide or mudflow.
- ▶ Check for injured or trapped people near the affected area, if it is possible to do so without entering the path of the landslide or mudflow.

## Exposure to Floodwater

Floodwater can disrupt water purification and sewage disposal systems and overflowing of toxic waste and chemical storage sites. Most floods do not cause serious disease outbreaks but they can cause sickness in workers who encounter contaminated floodwater. Avoid unnecessary contact with any floodwater. Assume that floodwater is not safe unless authorities have specifically declared it safe. To avoid disease wash hands at every opportunity. Before entering floodwaters, you should don plastic or rubber gloves, boots, and other protective clothing needed to avoid contact with floodwater.

## Insects

Initially, many insects are killed by the eruption. However, mosquitoes and flies will rebound at significantly higher levels. To reduce exposure to harmful insects, use the DOD Insect Repellent System:



\*Do not treat Flame-Resistant Army Combat Uniforms (FR ACU's) with permethrin using the IDA kit, aerosol can, or 2-gallon sprayer method. Contact your local preventive medicine unit for further information.

## Hazardous Plants

Some plants can irritate the skin if touched. When burned they can irritate the skin and lungs. Avoid skin contact with plants when possible and wash contaminated skin and clothing after contact. Leaves of three – leave them be.

## Personal Protective Equipment (PPE)

The level of personal protective equipment (PPE) required will depend upon your role in the effort. Anticipate and bring items such as a hard hat, goggles, heavy work gloves, steel-toed boots and hearing protection. Some PPE items may not be standard issue for most U.S. military personnel.

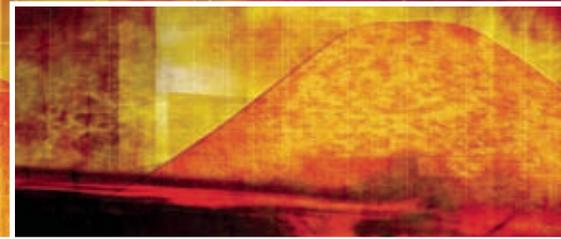
## Military Vaccine Requirements

Refer to MILVAX at <http://www.vaccines.army.mil/> for up-to-date vaccine requirements.



U.S. Army Center for Health Promotion & Preventive Medicine

<http://chppm-www.apgea.army.mil>  
SIPRNet: <http://usachppm1.army.smil.mil>  
(800) 222-9698/ DSN 584-4375/ (410) 436-4375  
SHG-027-0608



# Deployment Health Guide: Volcanic Eruption Response

## USACHPPM

This deployment health guide provides information that can help reduce your risk of injury and disease when deployed in response to a disaster. Army G-1 Personnel Policy Guidance (<http://www.armyg1.army.mil/MilitaryPersonnel/ppg.asp>) requires that you also receive a preventive medicine briefing prior to your deployment.

## Overview

Volcanoes spew hot, dangerous gases, ash, lava, and rock that are powerfully destructive. People have died from volcanic blasts. Volcanic eruptions can result in additional threats to health, such as floods, mudslides, power outages, water contamination, and wildfires. Health concerns after a volcanic eruption include infectious disease, respiratory illness, burns, injuries from falls, and vehicle accidents related to the slippery, hazy conditions caused by ash. When warnings are heeded, the chances of adverse health effects from a volcanic eruption are very low.

## Communication

Other Federal, state, and local officials may have higher authority than your agency and they may be coordinating the on-scene efforts. Communicate with them and understand how your mission fits into the response efforts.

## Site Safety

Before you begin any response efforts, an on-scene safety officer should brief you about site safety and health issues. As conditions and missions change, the safety officer should provide updated information to allow for adjustments in safety measures.

## Volcanic Ash

Exposure to ash can harm your health, particularly the respiratory tract. To protect yourself while you are outdoors use an N-95 disposable respirator. It is important to follow directions for proper use of this respirator. If you don't have an N-95 respirator, you can protect yourself by using a nuisance dust mask as a last resort, but you should stay outdoors for only short periods while dust is falling. Nuisance dust masks can provide comfort and relief from exposure to relatively non-hazardous contaminants such as pollen, but they do not offer as much protection as an N-95 respirator.

## Gases

Most gases from a volcano quickly blow away. However, heavy gases such as carbon dioxide and hydrogen sulfide can collect in low-lying areas. The most common volcanic gas is water vapor, followed by carbon dioxide and sulfur dioxide. Sulfur dioxide can cause breathing problems in both healthy people and people with asthma and other respiratory problems. Other volcanic gases include hydrogen chloride, carbon monoxide, and hydrogen fluoride. Amounts of these gases vary widely from one volcanic eruption to the next.

Although gases usually blow away rapidly, it is possible that people who are close to the volcano or who are in the low-lying areas downwind may be exposed to levels that may affect health. At low levels, gases can irritate the eyes, nose, and throat. At higher levels, gases can cause rapid breathing, headache, dizziness, swelling and spasm of the throat, and suffocation.

## Earthquakes / Wildfires

Volcanic eruptions may trigger earthquakes and result in wildfires. For further information on protecting yourself against these hazards see the following:

Deployment Health Guide: [Earthquake Response](http://chppm-www.apgea.army.mil/documents/products/EarthquakeDHG.pdf) (<http://chppm-www.apgea.army.mil/documents/products/EarthquakeDHG.pdf>)

Deployment Health Guide: [Wildfire Response](http://chppm-www.apgea.army.mil/documents/wildfire/WildfireResponse_10_31.pdf) ([http://chppm-www.apgea.army.mil/documents/wildfire/WildfireResponse\\_10\\_31.pdf](http://chppm-www.apgea.army.mil/documents/wildfire/WildfireResponse_10_31.pdf))

## Physical Injury

Moving debris can cause cuts, scrapes, bruises, and sprains especially to the hands, back, knees, and shoulders. Wear leather gloves, safety goggles, and steel-toed shoes. Avoid lifting more than 50 pounds per person. Be sure you've had a tetanus vaccination within the past 10 years.

## Electrical Hazards

If there has been water anywhere near electrical circuits and electrical equipment, turn off the power at the main breaker or fuse on the service panel. Do not turn the power back on until the electrical equipment has been inspected by an electrician. If you must work near a downed power line, contact the utility company to de-energize and ground or shield the power lines.

## Carbon Monoxide

Carbon monoxide is a colorless and odorless gas that can kill you. Gasoline- or diesel-powered pumps, generators and pressure washers produce carbon monoxide. Never operate gasoline-powered equipment indoors. Symptoms of low-level exposure include shortness of breath, mild nausea, and mild headaches. If you suspect carbon monoxide exposure, move to fresh air immediately and seek medical attention.

## Unstable Structures

Volcanic eruptions can damage walkways, parking lots, roads and buildings. Don't work around any damaged building until it has been certified safe by an engineer or architect. Assume all structures are unsafe until they are inspected. Leave at once if shifting or noise signals a possible collapse.

## Heat and Cold Stress

### Heat

- ▶ Full heat acclimatization takes 7-14 days of physical exertion in the heat. Physical exertion should start slowly but increase in intensity and duration.
- ▶ Drink enough water to replace sweat loss. If your urine becomes dark yellow and infrequent, drink more fluid.
- ▶ Use work-rest cycles and when possible, work during the cooler hours of the day. (See Figure 1)
- ▶ Get medical attention for heat cramps, exhaustion, or stroke.
- ▶ Use sunscreen.

### Cold

- ▶ Remember **C-O-L-D**: keep clothing **C**lean, avoid **O**verheating, wear clothing **L**oose and in layers, and keep clothing **D**ry. (see Figure 2)
- ▶ Standing or working in water that is cooler than 75° F will remove body heat faster than it can be replaced and can result in hypothermia. Take frequent breaks **out of the water**.
- ▶ Change your socks frequently to keep your feet dry.
- ▶ Use the buddy system to check for signs of cold injury.
- ▶ Get medical help for loss of sensitivity in any body part, mental slowness, or uncontrollable shivering.

## Hazardous Materials

Volcanic debris or eruption triggered earthquakes may dislodge tanks, drums and pipes containing hazardous materials. Contact the local fire department or hazardous materials team before moving unidentified containers. In contaminated areas, wear protective clothing and respirators. Wash exposed skin areas frequently.

## Fire

Fire protection systems may be inoperable. Bring two or more fire extinguishers with a UL rating of at least 10A (suitable for putting out wood, paper and cloth fires) to each cleanup job.

## Confined Spaces

Toxic gases, a lack of oxygen, or explosive conditions may exist in a confined area. Because many toxic gases and vapors cannot be seen or smelled, **never** enter a confined space unless you have been properly trained; even to rescue a fellow worker! Contact the fire department for help.

If you are certified to enter confined spaces:

- ▶ Molding or fermenting agricultural materials in confined spaces may generate large amounts of toxic gases which could cause lung damage or death if inhaled.
- ▶ Turn on fans or blowers in silos and other storage areas at least 30 minutes before entering and leave them on while working.

## Bloodborne Pathogens

If you come in contact with blood or other body fluids, treat the blood and body fluids as infectious. Wear gloves and eye protection. If necessary, you can improvise with a towel or plastic bag to avoid contact.

## Dealing with Human Remains

In disasters, there is the possibility of coming in contact with people who have died under tragic circumstances. Leave them in place and notify mortuary affairs or your chain of command. Note that human and animal remains do not pose a disease threat for people not directly involved with recovery.

If you do work directly with remains:

- ▶ Wear latex or similar gloves with a cut-proof inner glove.
- ▶ Limit exposure to the stimuli - use screens and barriers to reduce views.
- ▶ You may experience a variety of feelings. Do not keep these emotions inside. They are normal, and are best worked through by talking with your team.
- ▶ Do not hesitate to talk with a chaplain or with a mental health provider in your area.

## Displaced Animals

Stress can change the temperament of normally friendly pets. Wild and domesticated animals will seek shelter in unusual places to avoid the rising waters. Do not handle birds or displaced animals. Do not keep pets or mascots. Contact animal control specialists for help.

## Supply Information

Item	NSN
Sunscreen Lotion	6505-01-121-2336
Non-alcohol Lotion Base Sunscreen	6505-01-267-1486
DEET Insect Repellent	6840-01-284-3982
Permethrin (IDA Kit) ("Snake & Bake")	6840-01-345-0237
Hearing Protection - Sound Guard Earplugs	6515-00-137-6345

Figure 1: Fluid Replacement and Work/Rest Guide

Heat Cat	WBGT Index, °F	Easy Work		Moderate Work		Hard Work	
		Work/Rest (min)	Water Intake (Qt/H)	Work/Rest (min)	Water Intake (Qt/H)	Work/Rest (min)	Water Intake (Qt/H)
1	78° - 81.9°	NL	½	NL	¾	40/20	¾
2	82° - 84.9°	NL	½	50/10	¾	30/30	1
3	85° - 87.9°	NL	¾	40/20	¾	30/30	1
4	88° - 89.9°	NL	¾	30/30	¾	20/40	1
5	> 90°	50/10 min	1	20/40	1	10/50	1

**Easy Work** = Walking on a hard surface at 2.5 mph with less than 30 lbs., weapon maintenance, marksmanship training

**Moderate Work** = Patrolling, walking in sand at 2.5 mph with no load, calisthenics

**Hard Work** = Walking in sand at 2.5 mph with load, field assaults

Figure 2: Wind Chill Temperature Table

Wind (MPH)	Temperature (°F)								
	40	30	20	10	0	-10	-20	-30	-40
Calm	40	30	20	10	0	-10	-20	-30	-40
5	36	25	13	1	-11	-22	-34	-46	-57
10	34	21	9	-4	-16	-28	-41	-53	-66
15	32	19	6	-7	-19	-32	-45	-58	-71
20	30	17	4	-9	-22	-35	-48	-61	-74
25	29	16	3	-11	-24	-37	-51	-64	-78
30	28	15	1	-12	-26	-39	-53	-67	-80
35	28	14	0	-14	-27	-41	-55	-69	-82
40	27	13	-1	-15	-29	-44	-58	-72	-86
45	26	12	-2	-16	-30	-44	-58	-72	-86
50	26	12	-3	-17	-31	-45	-60	-74	-88
55	25	11	-3	-18	-32	-46	-61	-75	-89
60	25	10	-4	-19	-33	-48	-62	-76	-91

Frostbite Times ▶ 30 minutes 10 minutes 5 minutes