



Oil Well Fires



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The following information will help you to become familiar with oil well fires and how they relate to your health.

What did the United States learn about oil well fires from the Gulf War?

Shortly before the beginning of the ground phase of the Gulf War, Iraqi forces set fire to hundreds of oil wells in Kuwait. There was a great deal of concern about the potential health effects of the smoke from these fires. Experts determined that the fires' high combustion efficiency, the nature and amount of the smoke's pollutants, the lofting effect created by solar heating, and the local wind and weather conditions combined to reduce the fires' impact on military and civilian populations. The smoke has been studied using ground air monitoring, satellite imagery, and computer modeling.

What pollutants did we find in the smoke?

Burning crude oil produces a wide range of pollutants, such as soot (mostly carbon) and gases (mainly carbon dioxide, carbon monoxide, sulfur dioxide, nitrogen oxides, volatile organic compounds [e.g., benzene], polycyclic aromatic hydrocarbons, hydrogen sulfide, and acidic gases [e.g., sulfuric acid]). Any resulting health effects would have depended on the concentration of the pollutants inhaled, the duration of exposure, and the proximity/location of the oil field fires. Considering the magnitude of the fires, levels of pollutants were much lower than initially presumed, as documented by the United States and foreign governments measuring the oil fires' pollutant levels. However, several of the pollutants from the fires (soot and naturally occurring particulate matter [e.g., sand, dust]) have been linked to upper-respiratory ailments and other serious illnesses.

Normally, the oil fire superplumes rose several thousand feet into the atmosphere and dispersed pollutants hundreds of kilometers downwind from the oil fires' source regions. This effect was confirmed by thousands of air and environmental samples taken in Kuwait and Saudi Arabia in 1991. These results showed that the levels of pollutants (with the exception of particulate matter) near the oil fires' source regions were much lower than those found in large urban centers in the United States, and much lower than the U.S.-recommended occupational levels.

Most environmental health hazards to U.S. service members would have come from the high levels of particulate matter from the natural environment, in combination with the smoke from the oil fires. The air in Kuwait and Saudi Arabia is known to contain high levels of naturally occurring particulate matter, such as windblown dust, dirt, and sand. A significant mass of the particles was

in the 10-micrometer diameter size range, a size that can be breathed into the lower regions of the lungs. The daily soot emitted from the oil well fires was estimated to be about 13 times that emitted from all combustion sources in the United States. Overall, the average level of particulate matter that could be breathed in (from all sources, including oil well fires) in Kuwait and Saudi Arabia during a seven-month period in 1991 was about 3 to 6 times greater than the annual U.S. standard.

What can I do to reduce my exposure to smoke and pollutants from oil well fires if they occur?

Avoid smoke plumes when possible and stay upwind of burning wells. Wash frequently to keep your skin free of soil and soot. Standard personal protective items, including goggles and cravats (large kerchief-type cloths), are available to all U.S. military personnel to help protect them against windblown sand in a desert environment.

Are there any potential health effects from exposure to oil well fires?

The levels of air pollutants from the oil well fires were confirmed to be much lower than those known to cause either short- or long-term health effects. However, the overall levels of particulate matter from oil well fires and other sources can potentially cause health effects. Potential health risks posed by inhaled particles are determined by the amount of particulate matter in the air, the length of exposure, the ability of the particles to reach various regions of the respiratory tract, and the body's biological responses to these materials. The largest particles settle in the air passages of the nose and sinuses, with somewhat smaller particles settling in the middle respiratory tract. Still smaller particles can reach the lower respiratory tract in the lungs. Pre-existing breathing conditions (e.g., asthma, lung conditions from smoking) can worsen if very high levels of these particles are inhaled over a long period of time. In general, the risks of adverse health effects from fine particles in the lower respiratory tract are greater than those in the upper air passages of the nose and sinuses.

What are the short-term effects of exposure?

You might experience reversible, short-term effects attributable to high levels of particulate matter. These include skin irritation; runny nose; cough; shortness of breath; eye, nose, and throat irritation; and aggravation of sinus and asthma conditions.

What are the long-term effects of exposure?

There is no definitive proof of long-term adverse health effects from exposure to the oil well fire smoke, and only limited evidence of any effect. Three published, peer-reviewed post-war studies related to exposure to the oil fire smoke have been identified. In one study using modeled oil well fire plume data, there was no increase in the risk of hospitalization at Department of Defense (DOD) facilities between 1991 and 1999 for 15 major categories of disease, including respiratory diseases. This study included 405,142 active duty Gulf War veterans. In another study conducted by the University of Iowa and the DOD on Iowa Gulf War veterans, there was no association found between exposure to oil fire smoke and asthma or bronchitis. The third study

conducted by the DOD found an association, although not a strong one, between modeled oil fire smoke exposure and asthma for the highest exposed groups. This study used 4,000 participants from the DOD Comprehensive Clinical Evaluation Program. The findings from this study are not definitive, however, and additional studies are required to determine if the oil fire smoke exposure is the actual cause of the Gulf War veterans' asthma.

Finally, physician-directed health screening studies completed on firefighters deployed to Kuwait, who experienced more severe, longer exposures than U.S. troops and did not use respiratory protection, show that these firefighters are in good health and have not experienced any long-term effects.

Where can I get more information?

- **Environmental Exposure Report—Oil Well Fires**
DOD Special Assistant for Gulf War Illnesses
www.gulflink.osd.mil/owf_ii/
- **A Review of the Scientific Literature As It Pertains to Gulf War Illnesses Volume 6, Oil Well Fires**
www.gulflink.osd.mil/library/rowl/
- **Environmental Exposure Report: Particulate Matter**
DOD Special Assistant for Gulf War Illnesses
http://www.gulflink.osd.mil/particulate_final/
- **PM—How Particulate Matter Affects the Way We Live and Breathe**
U.S. Environmental Protection Agency
<http://www.epa.gov/air/urbanair/pm/index.html>
- **U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM)**
Phone: 800-222-9698
Internet URL: <http://chppm-www.apgea.army.mil>
Environmental sampling and risk assessment: Mr. Jeff Kirkpatrick, 410-436-8155
General medical information: Dr. Coleen Weese, 410-436-2578
- **Air Force Institute for Environment, Safety and Occupational Health Risk Analysis (AFIERA)**
Phone: 888-232-3764
Internet URL: <http://www.brooks.af.mil/afiera/>
General medical information: Lt Col (Dr.) Kenneth L. Cox, 210-536-1788
- **Navy Environmental Health Center (NEHC)**
Phone: 757-953-0764
Internet URL: <http://www.nehc.med.navy.mil>
General medical information: CDR (Dr.) Alan Philippi
- **Deployment Health Clinical Center (DHCC)**
Phone: 866-559-1627
Internet URL: <http://www.pdhealth.mil/>
Post-deployment health care information: LTC (Dr.) Charles Engel
- **Department of Veterans Affairs**
Internet URL: www.va.gov/environagents/