

Cancer Risk and Military Environmental Exposures

What is cancer?

Cancer is a disease resulting from genetic changes that cause some of the body's cells to grow uncontrollably.¹⁻² Genetic changes that cause cancer can be due to—

- Random errors that occur as cells divide.
- Inherited genes.
- Damage from harmful substances (personal, occupational, environment exposures).

Normally, when cells grow old or become damaged, they die, and new cells take their place. The body normally eliminates damaged cells before they turn cancerous. Since the body's ability to do so decreases with age, there is a higher risk of cancer later in life.

When abnormal or damaged cells grow and multiply, cells may form tumors, which are lumps of tissue. Tumors can be cancerous (malignant) or not cancerous (benign). Cancerous tumors spread and can travel throughout the body to form new tumors (a process called metastasis).

Many cancers form solid tumors (e.g., carcinomas, sarcomas, lymphomas, melanomas), but cancers of the blood (e.g., leukemias or myelomas) generally do not.¹⁻²

What is the threat to the force?

Because cancer can start almost anywhere in the human body, there are nearly 200 types of cancer. In the U.S., 1 in 3 people will be develop cancer in their lifetime.²

An estimated 2 to 8% of all cancer deaths are caused by occupational exposures.³ Lung, bladder, laryngeal, leukemia, and liver cancers are common occupational cancers.⁵ Most cancers are associated with a combination of factors, which includes exposures associated with personal lifestyle choices.²⁻³

Active-Duty military Service members may be exposed to unique exposures during garrison or deployed duties that could also increase their risk cancer. Concern that a military exposure is associated with cancer can lead to diminished morale and trust for Service members and Veterans. Force strength can be degraded by medical, political, and legal actions.

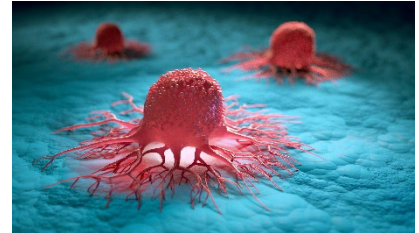
Exposure to a harmful substance may not be known to increase cancer risk during the time of exposure. As more data are collected, often over several years, an association may be found. Some military exposures have been clearly linked to certain cancers, while others are considered possibly linked. Due to the latency period for cancer to develop, Veterans may be more likely to be diagnosed than Service members on Active Duty.

(see examples on next page).

What substances can cause cancer?

The [National Toxicology Program \(NTP\) Report on Carcinogens](#)⁴ identifies the different chemicals, infectious agents, physical agents, mixtures, and exposure scenarios that have been found to cause cancer.

A substance is listed in the NTP as either *known* to be a human carcinogen or as *reasonably anticipated* to be a human carcinogen, depending on the strength of data.



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Exposure to a carcinogen may increase one's risk of getting cancer, but does not necessarily mean cancer will develop. Exposure to a carcinogen often requires repeated exposures, sometimes for months or years. The time between exposure and occurrence of disease (cancer latency period) can range from a few years to decades.¹⁻⁴

In addition to the frequency, duration, and amount of exposure to a carcinogen, the person's unique risk factors, genetics, and family history also determine how likely a person is to develop cancer.

Personal behavior exposures to carcinogens are significant risk factors, especially when long term to include:

- **Tobacco and smoking**, listed as a known human carcinogen in the NTP report,⁴ can cause cancer almost anywhere in your body, in addition to lung cancer. Higher or longer exposure, including from secondhand smoke, increases risk.
- **Alcohol** is also a known human carcinogen.⁴ Drinking increases risk of several kinds of cancer such as mouth, throat, liver, colon, rectum, breast, and prostate. The more drinks, the higher the risk.

Other personal characteristics, such as obesity, also contribute to a person's risk of developing cancer.³

Carcinogens most often linked to occupational and environmental exposures have included:¹⁻⁴

- **Heavy metals** (e.g., arsenic, beryllium, nickel, cadmium, hexavalent chromium)
- **Solvents** (e.g., benzene, trichloroethylene, vinyl chloride)
- **Natural gases** (e.g., radon)
- **Physical agents** (e.g., asbestos fibers, x-rays and ultraviolet (UV) radiation)

What carcinogens have been linked to military exposures?

Service members' exposures to carcinogens may occur in occupational settings such as civilian workers, as well as in military-unique activities. Exposures (chemicals and mixtures, amounts and frequency of exposures) are evaluated by military and non-military scientists to determine the potential relationship to different types of cancer. The Veterans Administration (VA) then identifies if exposures are known or presumed to be linked to certain cancers.⁵ For example:

- [Burn pit smoke \(Iraq, Afghanistan 2001–2011\)](#) is burning waste in open pits at military bases that may have produced smokes that contained known carcinogens, such as benzene,⁴ and assumed carcinogens,⁴ such as soots, diesel exhaust particulates, and organic fumes. Exposures are presumptively linked to several cancers including of the head; neck; brain; throat; kidneys; skin; and pancreatic, gastrointestinal, and redroductive systems.
- [Camp Lejeune, North Carolina water supply contamination \(1953–1987\)](#) involved people living or working at the U.S. Marine Corps Base Camp who were potentially exposed to contaminated drinking water. Known human carcinogens,⁴ such as industrial solvents trichloroethylene from dry cleaning waste and benzene from leaking underground fuel storage tanks, were detected in the water on the base. Exposures are presumptively linked to several types of cancer (e.g., leukemia, bladder, kidney, liver, multiple myeloma, Non-Hodgkin's Lymphoma).
- [Specific ionizing radiation](#) exposures, such as the radiological cleanup of Enewetak Atoll (1977–1980), are considered "presumptively" related to various cancers (e.g., bile ducts, bone, brain, breast, colon, esophagus, gall bladder, liver, pancreas, pharynx, ovary, salivary gland, small intestine, stomach, thyroid, urinary tract); leukemia (except chronic lymphocytic leukemia), lymphomas (except Hodgkin's disease), and multiple myeloma.
- [Mustard gas](#) (World War I and World War II, Iran-Iraq war, 1940s–1980s) is a chemical warfare blister agent presumptively linked to acute nonlymphocytic leukemia, nasopharyngeal cancer, laryngeal cancer, lung cancer (except mesothelioma), and squamous cell carcinoma of the skin. Some "volunteer Soldiers" were exposed via skin contact or aerosol dispersal during U.S. military equipment tests in the 1940s. Some [Operation Iraqi Freedom service members](#) who demolished or handled explosive ordinance may have been exposed.
- [Agent Orange](#) (Vietnam, used 1965–1971) is a dioxin-containing herbicide used extensively by U.S. Forces during Vietnam War to destroy enemy foliage cover. Depending on location and activity, exposures were through inhalation and/or contact. This known human carcinogen⁴ is linked to many cancers (e.g., bladder, leukemia, prostate, myelomans, Hodgkin's Disease, and non-hodgins lymphomas) and other chronic health conditions.

The VA⁵ has not found evidence of a cancer link from the [Qarmat Ali wastewater treatment plant Iraq \(2003\)](#), where contamination (yellow powder) of hexavalent chromium, known human carcinogen, was present. Certain ailments have been presumptively associated with the [Gulf War exposures \(1990–1991\)](#) (e.g., Kuwaiti oil-well fire smoke and nerve agents at the Khamisiyah, Iraq weapons demolition site), but the VA has not linked cancers to these exposures.

What is the military doing to address cancer ?

Military providers and Service members themselves can access deployment sites [Periodic Occupational and Environmental Monitoring Summary \(POEMS\)](#) at <https://ph.health.mil/topics/envirohealth/hrasm/Pages/POEMS.aspx> or the VA website.⁵ Additionally, Service members may register exposures in the Airborne Hazard and Open Burn Pit Registry at <https://veteran.mobilehealth.va.gov/AHBurnPitRegistry/#page/home>.

How can cancer be prevented?

The U.S. Environmental Protection Agency and Occupational Safety and Health Administration establish regulations to protect the public and workers from detrimental exposures to carcinogens. Policies drive procedures (e.g., manufacturing controls and waste disposal practices) and equipment (e.g., masks) to help reduce cancer risks.

But, the most significant way each person can reduce their risk of cancer is through personal lifestyle changes, such as quitting smoking, limiting alcohol consumption, using sunscreen, using a radon detector in the home, and maintaining a healthy body weight through exercise and a good diet. Also, importantly, everyone should get routine screenings for various cancers based on their risk factors. Go to: <https://www.cancer.gov/about-cancer/screening/screening-tests>.

Key Information Sources

1. ["Comprehensive Cancer Information," NCI](#), accessed May 6, 2024. <https://www.cancer.gov/>
2. ["Understanding Cancer," American Cancer Society](#), accessed May 6, 2024.
3. Purdue M, et al. 2015. "The proportion of cancer attributable to occupational exposures." *Ann Epidemiol* 25(3):188–92. doi: 10.1016/j.annepidem.2014.11.009
4. HHS. 2021. NTP, 15th Report on Carcinogens. <https://ntp.niehs.nih.gov/whatwestudy/assessments/cancer/roc>
5. "Military Exposures," VA, last updated March 14, 2024. <https://www.publichealth.va.gov/exposures/index.asp>