



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE SPACE COMMAND

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16 July 2003

MEMORANDUM FOR AFSPC WING, NAF AND CENTER COMMANDERS
HQ AFSPC DIRECTORS

FROM: HQ AFSPC/SG
150 Vandenberg Street, Suite 1105
Peterson AFB CO 80914-4550

SUBJECT: Cancer Concerns Among Missileers

1. In 2001, a former 564 MS member sent a message saying that he had been diagnosed with Hodgkin's Disease (a type of lymphoma) and that he knew of two other 564 MS alumni who also had cancer, one with Hodgkin's Disease while the other had non-Hodgkin's lymphoma. All three individuals worked in the squadron at some point between 1994 and 1997. Understandably, this report generated questions about a possible link between working as a missileer at Malmstrom AFB and developing cancer, especially lymphoma.
2. In response, the Air Force Institute for Operational Health (AFIOH, formerly AFIERA) and the 341 MDOS bioenvironmental engineering office conducted a thorough industrial hygiene survey of all 564 MS Missile Alert Facilities (MAF) and their attendant Launch Control Centers (LCCs) focusing on known lymphoma risk factors. The sampling included looking for potential exposures to airborne substances from either inside or outside sources; testing the drinking water; investigating general indoor air quality issues; and determining if there was any contact with polychlorinated biphenyls (PCBs) or other hazards. The investigators concluded that the various 564 LCCs provided a safe and healthy environment for the missileers.
3. AFIOH also provided information about these types of cancers. Hodgkin's Disease and non-Hodgkin's lymphomas both produce abnormal white blood cells (lymphocytes) that are part of the body's natural defense system. But, they are separate and distinct diseases with very different risk factors. Hodgkin's lymphoma is most common in young adults and unfortunately, two people developing the same disease can occur purely by chance, even in a relatively small group of people. At the time of the investigation, there was no evidence that there was an unusual amount of cancer in this community.
4. Recently, there has been renewed concern about lymphomas (and possibly other cancers) in other missileers who worked at Malmstrom AFB from 1995-2000. While specific information is still pending, the people are believed to be former members of the 564th, 12th and 10th Missile Squadrons. We would like to request your help in addressing these issues.

5. Our first priority is to get information to the people who are concerned, some of whom may never have seen the results of the earlier investigation. We recommend providing this memo and the attached information sheets about the 2001 AFIOH industrial hygiene survey, lymphomas and cancers to your squadron member's and their families.
6. AFIOH needs to determine how many people who worked as missileers after 1 Jan 1994 developed cancer and what the specific types of cancer were. Although the focus has been on Malmstrom AFB, it may be best to seek information from all missileers to make sure we don't miss identifying some type of pattern or relationship. This information should quickly clarify whether or not this is truly a cancer cluster (in other words, has there been more cancer in this community than we would normally expect?). With this in mind, AFIOH would like to establish a temporary public health registry to gather this information. Please let people know that they can contact AFIOH directly (toll-free, 1-888-232-3764 or DSN 240-3471) or to speak with their base public health office. Given the increasing emphasis on personal privacy, it is best if the actual people who have developed disease or their survivors contact us so that we know they are willing to release the information we will need.
7. Your local Team Aerospace assets are also available for support. The bioenvironmental engineering (BEE) office routinely assesses work environments and can provide information about their past evaluations. Generally, the findings for the capsules have always been consistent with a safe and healthy work area. While the BEEs routinely monitor air/water/soil quality, there isn't any reason to pursue additional specific sampling until we have more information about the people with cancer. Then, depending on the diagnoses, specific types of sampling might be reasonable. AFIOH will provide sampling recommendations to AFSPC, if appropriate. The public health office monitors health events in the base population and can report on past disease patterns in the local community. Flight surgeons are excellent resources since they are familiar with operational activities and can address any medical questions that arise.
8. Finally, we hope you will encourage anyone who has concerns about their health to talk to their primary care physician. AFIOH will gladly provide consultative support to any physicians who have questions.
9. It would be wonderful if we could just push a button and get instant answers to questions like this, but it just isn't possible. We need to allow a reasonable period of time for concerned people to provide their personal information. Then we must validate the diagnoses, which is especially difficult and time consuming for those people who were diagnosed after leaving active military service. Only then will we be able to say whether the situation has changed since the previous investigation. It is important to go through these steps in a methodical fashion. We have to be sure that each person actually has cancer (their physician may have mentioned cancer initially, but later found a different explanation) and what specific type of cancer each person had/has. Unfortunately, cancer is far from rare and some types of cancer, like Hodgkin's Disease, are more common in younger people. Depending on the results of the initial analysis, it

may be necessary to initiate other types of epidemiological studies to investigate possible associations with specific geographic regions or exposures to various physical agents (e.g., chemicals, radiation, etc.). Unfortunately, this will take time, on the order of months. AFIOH will provide monthly updates until the final report is ready so that people know how the investigation is progressing.

10. Please do not hesitate to contact HQ AFSPC POC: Col Coates, DSN 692-6810, Donald.Coates@peterson.af.mil and/or AFIOH POC: Lt Col Marco Garcia, DSN 240-3471, Marco.Garcia@brooks.af.mil with any questions or suggestions you have.



STEPHEN L. MEIGS, Col, USAF, MSC
Command Surgeon

Attachments:

1. Cancer, General Information Sheet
2. Hodgkin's Disease and Non-Hodgkin's Lymphoma Information Sheet
3. Summary of Results from AFIOH's 2001 Industrial Hygiene Survey of the 564 MAF
4. PowerPoint Presentation Summarizing AFIOH's 2001 Investigation

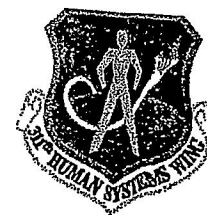
cc:

Medical Group Commanders



Cancer

General Facts and Information



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This fact sheet answers some of the more common health questions about cancer. This fact sheet will provide some basic information on how cancers originate, the most common types, and known risk factors.

How common is cancer?

Cancer is the second leading cause of death in the United States and approximately one out of every two American men and one out of every three American women will have some type of cancer during their lifetime.

Cancer occurs in Americans of all racial and ethnic groups and the rate of cancer occurrence or its incidence rate varies from group to group. Although cancer can occur at any age, about 77% of all cancers are diagnosed in people age 55 and older.

What causes cancer?

Cancer cells develop because of damage to their DNA (material present in the nucleus of every cell), making cells in a part of the body begin to grow out of control. People can inherit damaged DNA, which accounts for cancers that sometimes run in families. Many times though, a person's DNA becomes damaged by environmental factors (diet, tobacco use, infectious diseases, chemicals and radiation), which cause an estimated 75% of all cancer cases in the United States.

What are the risk factors for cancer?

Different kinds of cancer have different risk factors but the most important include: the person's age, sex, family medical history, lifestyle (including diet, sun exposure, use of tobacco and/or alcohol), and cancer-causing factors in the environment.

Research shows that about one-third of all cancer deaths are related to dietary factors and lack of physical activity in adulthood, however, the risk of developing most types of cancer can be reduced by changes in lifestyle (eating a healthy diet and/or quitting smoking among others).

For example, smoking alone causes one-third of all cancer deaths. Cancers of the lung, mouth, larynx, bladder, kidney, cervix, esophagus, and pancreas are related to tobacco use, including cigarettes, cigars, pipes, chewing tobacco, and snuff.

Skin cancer is related to unprotected exposure to strong sunlight.

The main risk factors for breast cancer are: age; changes in hormone levels throughout life, such as age at first menstruation, number of pregnancies, and age at menopause; physical activity and obesity. Some studies have shown a connection between alcohol consumption and increased risk of breast cancer. Women with a mother or sister who have had breast cancer are more likely to develop the same disease.

In men, the following factors increase the chances of developing prostate cancer: age, race, and diet. The chance of getting prostate cancer goes up with age. Prostate cancer is more common among black men than among white. A high-fat diet may play a part in causing prostate cancer. Also, men with a father or brother who have had prostate cancer are more likely to get prostate cancer themselves.

The sooner a cancer is found and treatment begins, the better are a person's chances for living longer. Therefore, the need for periodic screening examinations, including tests that adults should have in order to find cancer early couldn't be overemphasized.

Where can I get more information? Source for more information:

- Air Force Institute of Operational Health (AFIOH)
Phone: 1-888-232-ESOH (3764), Internet URL: <http://starview.brooks.af.mil/afioh/>
- WebMDHealth: WebMD (<http://www.webmd.com>)
- Cancer Epidemiology and Prevention, second edition. Schottenfeld, David; Fraumeni, Joseph. Oxford University Press, 1996
- Centers for Disease Control and Prevention web page: <http://www.cdc.gov/>
- National Cancer Institute: <http://www.nci.nih.gov/atlasplus/index.html>





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Hodgkin's Disease and Non-Hodgkin's Lymphoma General Facts and Information



This fact sheet answers some of the more common health questions about Hodgkin's disease and non-Hodgkin's lymphoma. This fact sheet will provide some basic information on the lymphoid system, how lymphomas originate within the lymphoid system, common characteristics of both Hodgkin's disease and non-Hodgkin's lymphomas, and known risk factors for these types of cancer.

What are lymphomas?

Lymphomas are cancers that develop in the lymphoid system, part of the body's natural defenses.

What is the lymphoid system?

The lymphoid system is a network of organs, vessels, and nodes that connect with the blood circulatory system to move a watery substance called lymph throughout the body. The lymphoid system produces white blood cells, called lymphocytes, and moves these blood cells wherever the body needs them. These cells produce antibodies that help fight infections.

Lymphocytes normally live a short period of time and only grow to a certain size. When someone has a lymphoma, their lymphocytes live much longer, reproduce much faster, and grow far larger than normal. This is what causes pain and swelling at the main cancer site. These cancerous lymphocytes can then spread throughout the body.

What causes lymphomas?

The cause of lymphomas is still not known, despite lots of research. Many studies focused on industrial chemicals, various occupations, electromagnetic fields, ultraviolet radiation, ionizing radiation, family history, social class, diet, and other potential exposures.

Many occupational studies have looked at people who work directly with wood or pesticides. There is a moderate association between occupational exposure to wood dust and Hodgkin's disease, although not all studies agree.

The association between chemical exposure and Hodgkin's disease is more varied than those seen with wood exposure. Organic solvents, pesticides containing chlorophenoxy herbicides, and other chemicals have been implicated in some studies, but follow-up studies could not confirm the association.

Associations between non-Hodgkin's lymphoma and chemical exposures have also been extensively studied with variable results. Benzene, known to cause leukemia, has not been associated with non-Hodgkin's lymphoma.

Studies of farmers have found an association between pesticide usage and non-Hodgkin's lymphoma, particularly for those who mixed or applied the pesticide. The association was stronger the more days a person worked with pesticides.

Ionizing radiation (like x-rays) causes some types of cancer and researchers wondered if it might cause non-Hodgkin's lymphoma, but the majority of studies failed to show any relationship.

Though the cause of these lymphomas is not known, there are certain risk factors we do understand. It is important to realize that even though Hodgkin's disease and non-Hodgkin's lymphoma are cancers of the lymphoid system, they are separate and distinct diseases with different risk factors, as shown below.

What are the risk factors for Hodgkin's disease?

Gender is a risk factor for Hodgkin's disease. Men, regardless of ethnicity, are more likely to develop the disease than women, with white men having the highest rate of disease. Recently, there has been a dramatic increase in the number of young women diagnosed with Hodgkin's disease, but it remains more common in men.

There are two age ranges in which an individual is most likely to get Hodgkin's disease, between 15 and 34, and over 55 years old with the risk continuing to increase as an individual ages. These are the most common ages, but keep in mind that children and middle-aged adults occasionally get Hodgkin's lymphoma, too.



AFIOH MAF Survey: 564 MS

2 - 5 July 2001

General Facts and Information



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This fact sheet summarizes the results of a 2 to 5 July 2001 survey performed by the Air Force Institute for Operational Health (AFIOH) to assess potential health risks to missile crews working in the Launch Control Centers (LCCs) of Missile Alert Facilities (MAFs) P, Q, R, S, and T. AFIOH's Industrial Hygiene team was asked to evaluate the working environment in response to concerns over possible links to various medical conditions reported by some crew members.

What was assessed?

The AFIOH team, working together with the 341st Medical Group's Bioenvironmental Engineering personnel, conducted an evaluation of the five LCCs for air and drinking water quality.

During the survey, the team collected samples of the air in each LCC for organic compounds, organophosphate and organonitrate pesticides, chlorinated and organonitrogen herbicides, and chlorophenols. Organic compounds are primary components of diesel fuel in the Launch Control Equipment Building (LCEB). The primary potential source of pesticides, herbicides, and chlorophenols is agricultural application in the farming area surrounding several of the MAFs.

The drinking water was analyzed for pesticides, herbicides, and metals.

Surface soil beneath the top-side ventilation system, where air is drawn into the LCEB, was analyzed for pesticides and herbicides.

The team assessed general indoor air quality by measuring the temperature, relative humidity, and carbon dioxide levels in sites P, S, and T. The amount of fresh air brought into the LCC was measured at every site.

What chemicals did you find in the air?

Concentrations of all substances sampled in the air were below laboratory limits of detection. In other words, we didn't find any of the chemicals sampled and the air is safe to breathe.

Is the soil hazardous?

The sampled soil contained trace amounts of several pesticides and herbicides. This would be expected in areas surrounded by farmland. The measured levels were compared to current Environmental Protection

Agency (EPA) risk models. These concentrations are well below laboratory standards, based on EPA data. This is considered to be a very low risk.

It is also important to note that any air containing suspended dust is drawn down from the surface and is filtered before being brought into the LCC, further limiting exposures.

What did you find in the water?

Low levels of some pesticides (Romeo), herbicides (Papa and Romeo), and metals are present in the drinking water (all 5 sites). All concentrations are less than the Maximum Concentration Limits (MCLs) allowed by the state of Montana and the EPA. This means that the water meets acceptable primary (health-related) drinking water standards for these substances and does not present any cancer risk.

However, there was no residual chlorine remaining in the LCC tap water at any of the five sites. Although bacteria did not grow from these water samples, chlorine should be present to ensure the water remains free of bacteria. Also, the water is fed to the LCC through black iron pipes. Black iron pipes may release metals that degrade the water's aesthetic qualities.

Additional samples should be collected to further assess the potability of the water.

Do we get enough fresh air?

In sites P, Q, R, and T, all temperatures, and relative humidity levels, and carbon dioxide concentrations in the LCCs fell within the indoor air guidelines established by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). The rate of fresh air brought into these LCCs is adequate.

At site Sierra, the make-up air fan was broken at the time of our survey. Consequently, carbon dioxide measurements were slightly higher than ASHRAE-



**Air Force Institute for Environment, Safety,
and Occupational Health Risk Analysis**

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**Workplace Assessment of
564 MS Launch Control Centers**



U.S. AIR FORCE

13 Nov 2001

Consultants

Lt Col Kenneth L. Cox

Maj Kevin Culp

14-15 Nov 2001



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Overview

- Meeting Guidelines
- Introductions
- Background Information
- Worker Concerns
- 341st Medical Group Response
- AFIERA Industrial Hygiene Survey
 - Methods, Results, Recommendations
- Actions (Accomplished/Pending)
- Question & Answer Period

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Hodgkin's Disease

Known Risk Factors

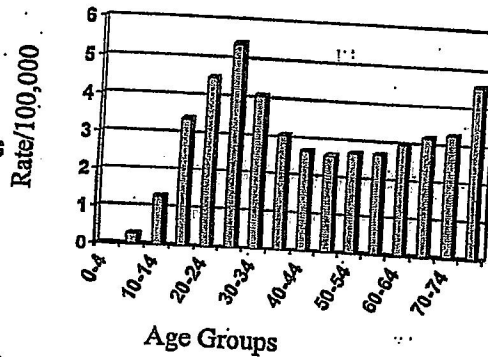
- Age and Gender
- Social Class
- Viral Infections

Reported Associations

- Pesticides
- Organic Solvents
- Other substances

Symptoms

- Painless swollen node
- Fevers, sweats, weight loss



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Non-Hodgkin's Lymphoma

Known Risk Factors

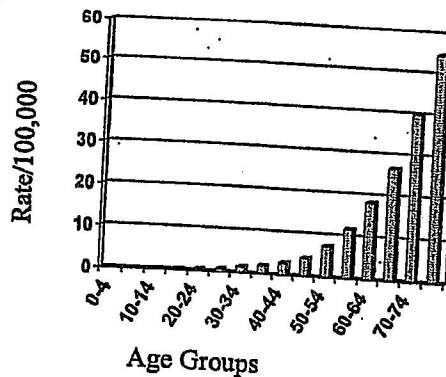
- Age and Gender
- Dietary
- Viral Infections

Reported Associations

- Benzene
- Ionizing Radiation
- Pesticides
- Other substances

Symptoms

- Painless swollen node
- Fevers, sweats, weight loss



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AFIERA Industrial Hygiene Survey

- **Survey focus**
 - **Basic approach: Evaluate workplace conditions, emphasize potential Hodkin's / Non-Hodgkin's factors**
 - **Airborne substances originating within MAF:**
 - Volatile organic compounds, from diesel fuel in generator (LCEB)
 - PCBs, from electrical equipment in LCC
 - Crypto tape combustion byproducts
 - Corrosion control activities (infrequent)
 - Biological substances
 - **Airborne substances originating outside MAF**
 - Pesticides and herbicides, including chlorophenols

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AFIERA Industrial Hygiene Survey

- **Survey focus (continued)**
 - **Drinking water**
 - Pesticides, herbicides, metals, bacteria
 - **General indoor air quality issues**
 - Temperature
 - Relative humidity
 - Carbon dioxide
 - Adequacy of fresh air flow
 - **Potential contact with PCBs**

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AFIERA Industrial Hygiene Survey

■ Results

- Air sampling: All concentrations below laboratory limits of detection
- General ventilation and indoor air quality
 - Fresh air levels fine except in Sierra (broken air handler)
 - Temperature and relative humidity meet recommended levels
 - Carbon dioxide:
 - A "marker" of fresh air adequacy
 - Papa and Tango well within ASHRAE standards
 - Sierra slightly elevated – confirms broken make-up air fan

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AFIERA Industrial Hygiene Survey

■ Results (continued)

- Drinking water
 - Most pesticides/herbicides below laboratory detection limits
 - Papa: Dalapon (herbicide) at 2.0 ug/L; limit is 200 ug/L
 - Romeo: Fluorine at 0.1 ug/L. No established limit.
 - Trace levels of metals in most LCCs; all within standards
 - Chlorine: No residual
- Soil
 - Trace levels of common pesticide/herbicide compounds
 - All far below EPA's "1 in a million" risk level
 - Note that all air is cleaned by CBR filter

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Conclusions

The 564 MS LCCs provide a safe and healthy working environment.

There are ways to further improve worker comfort.

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Recommendations to Improve Comfort & Strengthen Safeguards

- Assess corrosion control activities
 - BEE, ongoing, describe system
- Ensure adequate make-up air
 - Initial focus on Sierra
 - Acquire adequate supply of make-up air fans
- Further assess the potability of LCC tap water
 - Using black iron pipe may make water taste bad
 - Lack of chlorine residual identified at all 5 sites
- Fix and maintain LCC sump pumps

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Resources

- **Contact points for additional information**
 - **341st Medical Group**
 - **Flight Medicine**
 - **Public Health**
 - **Bioenvironmental Engineering**
 - **564th Missile Squadron Facility Managers**
 - **341st Civil Engineering**
 - **341st Operations Group**

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