

Improved Prevention of Firefighter Cancer

Matt Janke

Cincinnati, Ohio

Term Paper for Firefighter Safety and Risk Management

June 2007

Firefighters are not typically too concerned with their own health. Firefighters and EMS workers many times place concerns about their own health and safety after those of the people they are trying to help. It is simply the way firefighters are. Unfortunately it took some terrible events over the past few years, such as the World Trade Center incident on September 11, 2001, to make us take a closer look at issues regarding our own health and safety. Many rescue workers walked away from that disaster with long lasting illnesses many of which are still beginning to surface. Undoubtedly more World Trade Center rescue workers will continue to become ill in the future as a result of their work during that time period. They breathed in many unknown chemicals and carcinogens that were in the air around “ground zero.” Those carcinogens are leading to many respiratory illnesses, and it may be many years before we know if what they breathed in will cause cancer.

Sadly too many firefighters are developing cancer from many types of exposures on the job. Not only do firefighters risk their lives while on duty to help others, the risks they take are causing many to lose their careers, and unfortunately their lives. The risk of cancer has hit close to home with the members of my department. We lost a Lieutenant to lung cancer in 2002. The cancer was a result of exposure to asbestos on the job. Many studies have been done on the effects of what firefighters are exposed to, and the health risks that they incur as a result of those exposures. There is no possible way for firefighters and fire departments to eliminate all possibilities of exposures; it sadly comes with the job. There will be times firefighters cannot avoid an exposure, but there are several things firefighters and fire departments can do to lessen the risks.

Cancer is sadly becoming a large threat to all people. The American Cancer Society (ACS) estimates there will be about 1,444,920 new cancer cases diagnosed in the United States

in 2007. This estimate does not include basal and squamous skin cell cancers, of which more than 1 million cases are estimated to be diagnosed. The ACS also estimates that 559,650 people in the U.S. will die of cancer this year at a rate of more than 1,500 people a day. Fortunately the 5 year relative survival rate for all cancers diagnosed between 1996 and 2002 is 66%, up from 51% in 1975-1977.¹ The cancer statistics from the ACS are only for the entire population, but they do show how high the incidences of cancer are in the U.S. Consider this information, and then take into account that firefighters have an increased risk of cancer over the general population. There are a number of cancers that firefighters have a risk greater than 2 times as likely as the general population to develop.²

As stated earlier, the cancer risk in firefighters hit close to home when a Lieutenant from my department lost his battle with cancer March 21, 2002 at the age of 54. With the permission of his family I am going to tell some of his story. Lt. Ben Cunningham was a 27 year veteran firefighter and an electrician for many years as well. He was diagnosed in July of 2001 with mesothelioma, a form of lung cancer caused by exposure to asbestos. Just four months prior to his diagnosis, he had a chest x-ray after a fall from a ladder during a structure fire. That x-ray was clear, and showed no signs of cancer. In July he began to have trouble breathing and went to the doctor where he was diagnosed. In less than four months the cancer had spread throughout much of his chest cavity. Ben was a very healthy individual, and had never been a smoker. He was nearing his retirement when he was diagnosed, and lived to reach that point, but sadly it was not a joyous occasion. He went to the National Institute of Health outside of Washington, DC in September of 2001 for treatment which was provided free of charge. While there they removed both of his lungs from his chest and, for a lack of a better term, scraped the cancer from them.

¹ American Cancer Society

² Firefighter Mark Noble Video

They also scraped the cancer from the inside of his chest wall, his diaphragm, and his pericardium. Only one lung was healthy enough to be returned to his chest. During his stay in Washington, DC, he was seen by a doctor from the International Association of Fire Fighters (IAFF). He was sent to study Ben's case to try and learn from it for the future. Ben returned to Cincinnati where he continued radiation treatments.

His death in March was ruled a duty related death which means he received workers compensation, which covered the medical expenses, and his retirement from the state pension. He was not eligible for line of duty death benefits from the federal government. Many years of his career was spent without the protection of an SCBA. The technology wasn't available and firefighters did not understand the importance of them when they were first introduced in the fire service. His exposure to asbestos likely came from many years of fighting different types of fires without the protection of an SCBA.³

There is much to be learned from sad deaths such as Ben's. Ben will never be forgotten and hopefully either will the cause of his death. Firefighters can learn from the many incidents of cancer in the fire service, and hopefully use the information to protect themselves from some of the same risks. The risk of cancer to firefighters is increasing, but there is much firefighter's can do to lower the risk to themselves and their fellow firefighters.

A study by the University of Cincinnati was published in the November 2006 edition of the *Journal of Occupational and Environmental Medicine*. This study is the largest comprehensive study to date investigating cancer risk associated with working as a firefighter. The study collected data on 110,000 firefighters from 32 published studies that looked at the risk of 20 different cancers. The study was led in part by Grace LeMasters, PhD., a professor of epidemiology and biostatistics at UC. She said "We believe there's a direct correlation between the

³ Smith, Sean. Interview

chemical exposures firefighters experience on the job and their increased risk for cancer.

Firefighters are exposed to many compounds designated as carcinogens by the International Agency for Research on Cancer (IARC), including benzene, diesel engine exhaust, chloroform, soot, styrene and formaldehyde. These substances can be inhaled or absorbed through the skin and occur both at the scene of a fire and in the firehouse, where idling diesel fire trucks produce diesel exhaust. Firefighters work in an inherently dangerous occupation on a daily basis. As public servants, they need, and deserve, additional protective measures that will ensure they aren't at an increased cancer risk."⁴

The study found that firefighters are at a higher risk than the general public to develop many types of cancers. The cancers found to have the highest increased risk include testicular cancer, non-Hodgkin's lymphoma, prostate cancer, and multiple myeloma. "Long-term exposure to cancer-causing agents increase cancer risk," Lockey said, "For testicular cancer there is a 100 percent increase in risk, for multiple myeloma there is a 50 percent increased risk, for non-Hodgkin's lymphoma it's a 50 percent increased risk, and for prostate cancer it's a 28 percent increased risk, compared with non-firefighters. Overall we found 10 cancers that were either possible or probable that were related to firefighting." According to this research, it is still unclear what chemicals or combination of chemicals is causing these cancers. It makes it difficult for researchers to say what needs to be done to better protect firefighters when they still have yet to determine what exactly is causing the cancers.

In an article published in Hazards Magazine, the author states "The world is facing a cancer epidemic which has been almost entirely missed in official statistics. Occupational cancer is killing thousands worldwide every day, but is not receiving adequate attention from workplace enforcement or public health bodies. Cancer is a very modern killer. Lung cancer reports were

⁴ UC HealthNews

relatively rare at the start of the 21st century.”⁵ This article refers to occupational cancers in general, but it is certainly still relevant to firefighters. Asbestos is the world’s largest industrial killer in history. Studies suggest exposure to asbestos could eventually account for 10 million deaths worldwide. At least 100,000 die each year – one person every five minutes. When someone is exposed to asbestos it can take as many as 20-50 years to surface in the form of cancer. Because asbestos is no longer used in construction, the amount of asbestos in structures is lessening, but it is definitely still there, and firefighters still risk being exposed to it on a regular basis.

Asbestos is not the only threat to firefighters. Mark Noble, a veteran firefighter from Olympia, Washington was diagnosed with brain cancer in 2002. The cancer again was a result of exposures on the job. He died January 15, 2005, only three years after his diagnosis. Mark Noble did not pass away without doing his best to protect the lives of his many fellow brother and sister firefighters. Noble spent the last three years of his life studying the increased risk of cancer in firefighters with the hopes of saving the lives of firefighters in the future. He helped produce a video with Ergometrics, a company who specializes in training video productions. In his video Noble talks about some of the common exposures firefighters have on the job.⁶

One of the most common exposures as a result of fires is Benzene. Benzene is a carcinogenic chemical that is found in many types of fires, and can remain in the air even in low smoke environments. According to Noble, the Boston Fire Department did a study where they found Benzene in 92% of fires. Benzene is found in high levels and is only second to carbon monoxide. These chemicals can be found even in low or no smoke environments such as a call for burnt food on the stove. A Dallas Fire Department study found benzene in 100% of 100 fires

⁵ Hazards Magazine

⁶ Firefighter Mark Noble Video

they studied. Benzene has been linked to cancers such as non-Hodgkin's Lymphoma⁷, which the UC study found firefighters to be at an increased risk for.

Another type of chemical found in many different types of fires is polycyclic aromatic hydrocarbons or PAH's. PAH's are carcinogens found as a result of burning rubber or tar. Most fires found in simple residential homes have a risk of exposure to PAH's. Roofs are constructed of shingles that are made with tar. When firefighters performing ventilation cut a hole and drop the rubber or tar material into the fire, it increases the exposure. It used to be common practice, and still is, in many fire departments to put out car fires without the use of an SCBA. Hopefully this practice is a lot less common than it used to be. There are many carcinogens that firefighters risk exposure to in car fires, including PAH's. OSHA regulations state that a maximum exposure to PAH's is 00.75ppm. Fires generally have levels near 20.00ppm.⁸ This increased exposure leads to a higher risk of Leukemia and Lymphoma.

One of the most preventable exposures the fire service has is exposure to diesel exhaust. A study completed by fire departments in New York, Boston, and Los Angeles found high exposures to diesel exhaust in fire stations. Fire stations are built differently than most structures. They have what is essentially a commercial garage attached, often very closely, to what is basically a residential living area. When firefighters run vehicles in the apparatus bays, the exhaust makes its way into the living quarters, and particulates can remain in the air for up to 24 hours. We cannot control exposures to many carcinogens on the fire ground, but exposures to diesel exhaust are an in house carcinogen we can control.

Studies done for Mark Noble's video found that firefighters with 10 to 19 years of experience have a 2 times or higher risk of getting different types of cancer. According to his

⁷ Hazards Magazine

⁸ Firefighter Mark Noble Video

video cancers such as Non-Hodgkin's Lymphoma, prostate, large intestine, and liver cancers carry a 2 times higher risk. Testicular cancer is a 2.5 times higher risk. Leukemia, lymphoma, bladder, and skin cancer are a 3 times higher risk. Brain cancer has a 3.5 times higher risk and kidney cancer is a 4 times higher risk. Multiple myeloma carries a 2.25 times higher risk for 10-19 years experience and a 10 times higher risk with 30 years of experience.⁹ These are some scary numbers to consider. But most, if not all, firefighters would continue to take the risks they do even with this information. There are things firefighters can do to help reduce the risks of cancer. Many are simple things, but involve some what of a cultural change in the way we as firefighters historically do things.

As a part of my research, I interviewed the safety officer of my department to see what he felt was important in preventing cancers in firefighters. I also found many safety tips through my additional research. One of the largest carcinogens that firefighters are exposed to is diesel exhaust, which mostly comes from our own apparatus. It is common to see firefighters run vehicles inside of the engine bays. This can be for many reasons, such as avoiding moving an apparatus outside during inclement weather for daily checks. In the case of inclement weather, the bay doors should be opened to allow much ventilation. Dangerous carcinogens are also released into the air during the short period of time when apparatus are started and driven out of the bays immediately for a call. As I discussed earlier these chemicals presents a real danger, lingering in the air for up to 24 hours. NFPA 1500 9.1.6 states, "The fire department shall prevent exposure to firefighters and contamination of living and sleeping areas to exhaust contamination at the source."¹⁰ Fortunately, there are many options for fire departments to help reduce this risk.

⁹ Firefighter Mark Noble Video

¹⁰ Ward Diesel

At my department, all engines and ladder trucks are equipped with a no smoke system that activates when the vehicles are started. The no smoke system is self contained on the apparatus, and is basically “fireman proof.” It operates on its own when the vehicle is started and when it is placed in reverse for backing into bays. According to the manufacturers website it is “a system that will contain (extract) the toxic particulate (soot) being emitted from internal combustion engines and meet all applicable federal, state, and local standards.”¹¹ The system installed on our apparatus also has a manual switch so it can be turned on while driving into a bay with rear doors. There are other systems available to fire departments. One system many departments use consists of connecting an exhaust hose to the tailpipe of the apparatus while it is inside the bay. This system is proven to work well, but does not take out the human element involved. It requires the hose to be manually placed on the apparatus. There are many advancements in diesel removal systems, and there is a new system available the filters the air in the entire bay with a ceiling mounted unit. This system requires no human interaction as well.¹²

Diesel exhaust is the one exposure that we as firefighters can control and significantly reduce our exposure to on a regular basis. By using an exhaust system in our stations, we can reduce the exposure to ourselves, the members of our crew, and the firefighters who are coming to work the following shift. Placement of our apparatus on a scene, especially ambulances, can also significantly reduce our exposure to toxic diesel exhaust. Use caution to not aim the exhaust pipe toward the patient you are treating; it not only exposes the patient, it also exposes you. Diesel exhaust exposures are certainly easy to control, but many other exposures are not.

¹¹ Ward Diesel

¹² Airmation

A known risk of the job is being exposed to any number of chemicals, carcinogens, and other cancer causing agents. The risk of being exposed to some rather terrible things is one firefighter's take every time they come to work, but it is a risk every firefighter is willing to take. There are some things we can do to control the exposures. Proper use of an SCBA is probably the number one thing that reduces exposures. Earlier I discussed the risks involved with exposures to asbestos, and chemicals such as benzene and polycyclic aromatic hydrocarbons or PAH's. Using an SCBA can dramatically reduce exposure to these and many other carcinogens. Too often we remove our SCBA masks during overhaul, or when entering a room that only has light smoke. Studies have found these environments are full of terrible chemicals and carcinogens. It takes some discipline and surely more energy from firefighters to wear their masks and carry around heavy SCBA's, but it is definitely worth the extra effort. Fire Departments should implement policies about SCBA use defining when they are required to be worn. Generally, if wearing them is being questioned, they should be worn.

There are other options available to fire departments as respiratory protection for fire fighters. Many SCBA manufacturers have options available for air filters that can be attached to face masks that will purify air during salvage and overhaul. These filters are not for use in IDLH atmospheres or atmospheres with low concentrations of oxygen, but they do serve as an option to protect firefighters without having to carry around an SCBA pack. Another option is a Powered Air Purifying Respirator or PAPR. These are a separate system that involves wearing a waist band with an air pump and filters on it, which provides fresh air to a face piece. This is not an option financially for most departments. The best way firefighters have to protect themselves from inhaling cancer causing agents is to use their SCBA whenever they are in doubt the air is clean. Firefighters need to encourage each other to use the proper protection on every call.

Another way we are exposed to cancer causing agents is absorption through our skin. It is imperative that firefighters properly clean themselves and their equipment after a fire or other similar call. Many of the same chemicals and carcinogens are absorbed by our PPE and then absorbed through our skin. It is important again to wear the proper PPE all the time. We always think of our fire gloves as protection from the heat and fire, but they are also just as important for protection from carcinogens. It is very easy to remove our gloves while cleaning up after a fire because they can sometimes be a hindrance, or because they are hot or wet. Wearing them, as well as the rest of your PPE, protects you and your skin. It is important to shower and wash your uniforms after a fire because if you don't you are just continuing to expose yourself the rest of your shift, and possibly exposing your fellow firefighters. Properly washing yourself will remove cancer causing agents and protect you from continued exposure. Along with doing these things on scene and around the fire station, there is something else that can be done to lesson the risk of cancer in firefighters.

Many recent studies have found a link between cancer and an individual's diet and lifestyle. These studies were not completed for firefighters specifically, but it is important information for firefighters and fire departments to consider. In recent years increased emphasis has been placed on the health and safety of firefighters. Studies have shown that healthier firefighters will stay on the job longer, and ultimately live longer. The International Association of Fire Chiefs (IAFC) and the IAFF felt this was so important, they joined together to form the Fire Service Joint Labor Management Wellness-Fitness Initiative. The initiative was designed to have a more holistic approach to wellness, and to remove the punitive physical fitness and wellness issues that are historic to the fire service.¹³ Although the initiative does not target cancer risks specifically, it is evidence that the health of firefighters is a greater concern than

¹³ IAFF

ever. With encouragement from the IAFC and IAFF, departments that choose to implement this program will see an effect on their members' cancer risk. There are many ties between an individuals' health and their risk for cancer.

According to the National Cancer Institute individuals who are obese have an increased risk for a number of different types of cancers.¹⁴ This fact coupled with a firefighters already increased risk of cancer, shows that maintaining a healthy weight is important for firefighters. The Wellness-Fitness Initiative teaches firefighters how to lose and control weight as well as live a healthier lifestyle, which much research indicates will lower the risk of cancer. Weight and health can be maintained through a healthy diet and exercise.

The American Institute for Cancer Research has a list of recommendations for cancer prevention. According to them

- Be as lean as possible without becoming underweight.
- Be physically active for at least 30 minutes every day.
- Avoid sugary drinks. Limit consumption of energy-dense foods (particularly processed foods high in sugar, or low in fiber, or high in fat).
- Eat more of a variety of vegetables, fruits, whole grains and legumes, such as beans.
- Limit consumption of red meats, such as beef, pork and lamb, and avoid processed meats.
- If consumed at all, limit alcoholic drinks to 2 for men and 1 for women a day.
- Limit consumption of salty foods and foods processed with salt (sodium).
- Don't use supplements to protect against cancer.

Special Population Recommendations

- It's best for mothers to breastfeed exclusively for six months and then add other liquids and foods.
- After treatment, cancer survivors should follow the recommendations for cancer prevention.

And always remember – do not smoke or chew tobacco.¹⁵

Most fire fighters do not have an issue with 30 minutes of exercise a day because fire fighters are typically are not sedentary by nature. Following the 30 minute minimum will lower

¹⁴ American Cancer Institute

¹⁵ American Institute for Cancer Research

your risk of cancer, as well as increase your health. Exercise according to a number of different organizations can be something as simple as taking a walk or working in the garden.

Diet is second only to tobacco as a preventable cause of cancer. According to the World Health Organization dietary factors account for approximately 30% of all cancers in Western Countries.¹⁶ Research has found that diets high in fruits and vegetables may reduce the risk of various types of cancers. People who consume high levels of red meats or processed meats potentially face an increased risk of cancer. There are many different opinions about what constitutes an anti-cancer diet, but most agree on the same principles.

Melanie Polk, a dietitian and director of nutrition education at the American Institute for Cancer Research said “Eat more fruits and vegetables. That’s the single most important step most people can take to lower their cancer risk.” The National Cancer Institute recommends 5 to 9 servings a day. Almost everything in the produce department can be considered a part of an anti-cancer diet. According to Colleen Doyle, director of nutrition and physical activity at the American Cancer Society, “The best rule of thumb is to go for color. In general, the deeper or brighter the color, the more antioxidants and cancer-fighting substances a fruit or vegetable contains.”¹⁷ Experts recommend replacing simple carbohydrates with complex carbohydrates because simple sugars quickly convert to glucose in the body, which can cause damage to healthy cells, leaving them more susceptible to becoming malignant. Eating whole grains and brown rice instead of white rice are also simple changes that can be made to help lower your cancer risk. This information is relevant to the entire population, but with fire fighters already increased risk for cancers, it is very important that fire fighters exercise and eat healthy. Since

¹⁶ World Health Organization

¹⁷ Alternative Medicine

fire fighters spend so much time together, it is important they encourage each other to eat healthier meals and exercise regularly.

The risks firefighters take on a regular basis rarely go unnoticed, the media surrounds firefighters daily. The increased risk of cancer that firefighters face is not seen by the media, and often not even by firefighters themselves. People don't see firefighters breathing in harmful chemicals, or being exposed to countless other cancer causing carcinogens. What can't be seen by the naked eye, are most often the scariest things. The media doesn't do reports on firefighters dying of cancer. They ignore it, and so do many firefighters. Firefighters and fire departments must learn to take care of themselves and each other. They must all know and learn about the terrible cancer causing effects of the many things they are exposed to daily. The risk of cancer can be significantly reduced by doing a few simple things. Diesel exhaust can and should be controlled, there are number of simple ways to limit exposures to it. SCBA's should, despite their hindrance, be worn whenever the air being breathed is not as clear as the air in the normal environment. Showers should be taken regularly while on duty, especially following a fire. Firefighters must also learn to eat healthy and exercise regularly. There are many lessons to be learned from the sad deaths of Lieutenant Ben Cunningham and Firefighter Mark Noble. They should not go unnoticed. The increased risk of cancer may never be eliminated from the job description, but it can be reduced.

“Let's try to control those risks that we do have control of,” Mark Noble.

References

“Cancer Facts and Figures 2007.” American Cancer Society. June 2007

http://www.cancer.org/docroot/STT/content/STT_1x_Cancer_Facts_Figures_2007.asp

You Need It Like a Hole In the Head: Firefighters and Cancer. Firefighter Mark Noble,

Olympia, Washington Fire Department. 2005. Ergometrics and Applied Personnel

Research, Inc. <http://www.ergometricsonline.com/markNoble/>

Smith, Sean. Personal Interview. May 2007. Lieutenant, Anderson Township Fire and Rescue

Department. Son-In-Law of Lieutenant Ben Cunningham

“Firefighters Face Increased Risk for Certain Cancers.” UC HealthNews. 11 Oct. 2006.

<http://healthnews.uc.edu/news/?/3750/>

“Work Cancer Prevention Kit: Part 1 - Occupational Cancer Briefing - Work Started It. Unions Will Stop It.” Hazards Magazine. March 2007.

<http://www.hazards.org/cancer/preventionkit/part1.htm>

Ward Diesel Filter Systems. 2006. December 2007. <http://www.warddiesel.com/>

Air Technology Systems. 2007. December 2007. <http://www.airtechnologysolutions.com/>

“Fire Service Joint Labor Management Wellness-Fitness Initiative.” International Association of

Firefighters. December 2007. <http://www.iaff.org/HS/Well/wellness.html>

“Obesity and Cancer: Questions and Answers.” National Cancer Institute. 16 March 2004. Dec

2007. <http://www.cancer.gov/cancertopics/factsheet/Risk/obesity>

“Guidelines for Cancer Prevention.” American Institute for Cancer Research. 2007. December

2007. http://www.aicr.org/site/DocServer/Guidelines_Brochure.pdf?docID=1550

“Cancer: Diet and Physical Activity’s Impact.” World Health Organization. 2007. December 2007. <http://www.who.int/dietphysicalactivity/publications/facts/cancer/en/>

Jaret, Peter. The Anti-Cancer Diet. Living Naturally. December 2007.

http://www.alternativemedicine.com/common/news/store_news.asp?SID_store_news=769&storeID=02AD61F001A74B5887D3BD11F6C28169&task=store_news