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National Fire Fighter Health Study: Project Summary

An Investigation of Chemical Exposure and Health Outcomes Among U.S. Fire Fighters

Fire fighters are at increased risk for several cancers that may be related to their occupational exposure to carcinogens, but the relationship between firefighting exposure and cancer risk is not understood. To improve the health of U.S. fire fighters, scientists from the Marine & Environmental Research Institute and the School of Public Health, Environmental Health Sciences Department, State University of New York-Albany propose to conduct a comprehensive assessment of chemical exposures and biomarkers of health effects related to cancer risk among 300 active-duty fire fighters at different locations across the country. The objectives are to identify critical exposure pathways and scenarios, chemicals and substances of highest concern, and biomarkers of early health effects of exposure that may predict cancer risk. The project has the support of the International Association of Fire Fighters (IAFF).

Background

Fire fighters have elevated rates of as many as 14 site-specific cancers that are thought to be related to their exposure to carcinogenic chemicals during firefighting. Overall, the data show that fire fighters are at high risk for occupational exposure to carcinogens and their cancer risk increases significantly with the duration of firefighting. To date, few studies have been conducted on fire fighter health, and the relationship between firefighting exposure and cancer risk is poorly understood.

Our recent pilot study, conducted in San Francisco, found elevated concentrations and distinct patterns of toxic, carcinogenic chemicals and combustion by-products in serum collected from 12 fire fighters after a fire event (Shaw et al. 2013, attached). The results suggest that the accumulation of specific chemicals during firefighting may place fire fighters at risk for cancer, endocrine disruption, and other adverse health outcomes.

Building on these and other data, we propose to conduct a comprehensive assessment of chemical exposures and biomarkers of health effects related to cancer risk among 300 fire fighters from three communities – Portland, Maine, St. Paul-Minneapolis, Minnesota, and Arlington-DC. Charlotte, North Carolina is also under consideration. At each location, a **Site Implementation Team** selected by the Fire Chief will facilitate the various phases of the study. A **National Fire Fighter Advisory Council** has been appointed to help ensure that the project lessens suffering and benefits the health of the nation's fire fighters.

Project Goal and Rationale

The **overall goal** is to improve the health of U.S. fire fighters by narrowing research gaps concerning the effects of their occupational exposure to toxic, carcinogenic compounds. The **rationale** is to generate sufficient exposure-disease relationship data that can be used to develop validated biomarkers of hazardous exposure in the fire service.

The **objectives** of the project are:

(a) Quantify levels of multiple toxic, carcinogenic chemicals to which 300 fire fighters are occupationally exposed; and
(b) Quantify levels of immune, inflammatory, and cellular biomarkers in fire fighter blood and urine and to examine possible relationships between these biomarkers and firefighting exposures.

The study size will enable us to evaluate sociobehavioral factors (race, gender, education, income, smoking, diet, other occupations) and occupational factors (duration of firefighting, role, personal protective equipment use) in the analysis of risk to fire fighters. Exposure and effects data generated on fire fighters will be compared with available data on the general population, fire fighters and first responders, and workers in relevant occupations. The findings may provide clues to exposure routes and contributing factors, which can support effective prevention strategies.

Selection Criteria And Sample Collection

Participating men and women fire fighters must be at least 30 years old, must be cancer-free at the study onset, will have served on active duty involving hazardous exposures for at least 5 years, and will not have worked in industries with known chemical emissions. On a one-time basis, all study participants will donate blood and urine samples at a medical clinic within 24 hours of responding to a fire. Clinical personnel will process, batch and ship the samples to the Wadsworth laboratory in Albany for analysis of a wide range of chemicals and a panel of biomarkers of effect. Additionally, selected participants will provide wipe samples (soot) from their skin and different areas of their gear for chemical analysis. These samples will be included in the shipment to the laboratory. All study participants will complete a comprehensive medical/occupational survey and a brief questionnaire at the time of sample donation.

Confidentiality

Data generated on individuals will be kept confidential and shared only with the individual study participants. The study results, using aggregate data without participant identifiers, will be published as peer-reviewed articles in scientific journals and as on-line reports, available to firefighting communities, health and safety personnel, and cancer and environmental/occupational health researchers.

Benefits to Firefighters

The findings will be disseminated to study participants to support their needs and result in changes that benefit fire fighter health. Also, the results can guide public health actions to reduce exposure during training and active firefighting, and provide early medical treatments to minimize disease onset and/or lessen suffering.

Scientific Team

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Endorsements

"What we find very disturbing is that until now, even though these cancers are known to be related to occupational exposure, there has never been a comprehensive effort to identify the chemical compounds involved. Your earlier research in California fire fighters demonstrated the need for this. Since the chemicals under investigation are present in almost all indoor environments, the findings from this study could have implications for protecting the health of all Americans."

"The IAFF believes [the Fire Fighter Health Study] will be of extraordinary benefit to the health and safety of all fire fighters. This is a real opportunity to gather much needed information that does not presently exist, and with your 30 years of experience in analyzing toxic compounds in the environment, you are the ideal research scientist to undertake this effort. It may even be possible to develop strategies to minimize toxic exposure risks if we knew what we were dealing with. It will also provide fire services with definitive data that can be used to strengthen existing presumptive cancer laws and establish laws in the 17 states that do not yet have any."

— Jim Brinkley, Director of Occupational Health and Safety, International Association of Fire Fighters

"By using this research to identify chemical compounds involved and scientifically relating those to the risks of cancer, we can more accurately implement protective measures. This will be the first attempt to quantify protective measures so that fire departments and local government can accurately apply risk management [principles] in dealing with occupational exposures."

— Jerome F. LaMoria, Chief, Portland Fire Department

"This study is important not only for Maine fire fighters but for fire fighters all across the US and Canada to see exactly what we are exposed to in addition to carbon monoxide and cyanide. We need to get a better handle as to how we can protect ourselves and prevent the exposure. At the end of the day we want to go home safely to our families and at the end of our careers to enjoy a disease-free life."

— John Martell, President, Professional Firefighters of Maine

"To date, a comprehensive study looking at the exposure of fire fighters to harmful compounds has not been conducted. However, there is data to suggest that fire fighters have a heightened risk of occupational exposure to carcinogens and, therefore, are at a greater risk for cancer the longer they serve. The Fire Fighter Health Study aims to build on this previous research… I am confident that this study will have a positive impact on Maine fire fighters and fire fighters across the nation."

— Susan M. Collins, United States Senator (R-Maine)

"Dr. Shaw's study will take a much needed, comprehensive look into the relationship between exposure to these carcinogenic chemicals and the long-term health of firefighters… Every day, firefighters risk their lives to protect and serve our communities, and we owe it to them to study the true extent of their sacrifice. This study will not only provide critical insight into the health risks posed by occupational exposure to carcinogenic chemicals, but also help our firefighters carry out their missions in a safer and more effective manner."

— Michael H. Michaud, former United States Congressman (D-Maine)

"Research conducted to date has shown that fire fighters have elevated rates of cancers that are believed to be related to occupational exposure to toxic and carcinogenic chemicals. But further research is needed in order to more fully understand the relationship between firefighting and the risk of cancer. Dr. Shaw and her colleagues propose to address current research gaps on this topic… This research is critically needed to address the health and safety of fire fighters, who put their own health and lives on the line day in and day out to protect others."

— Chellie Pingree, United States Congresswoman (D-Maine)