

## Chemicals and Breast Cancer Risk

There are very few studies on women firefighters and the risk of female cancers, including breast cancer. Other studies of workplace exposures to certain chemicals have shown some evidence of a higher risk of breast cancer. Some of these chemicals are also encountered in firefighting (see *Formaldehyde and Benzene*, below). Hence, it is prudent to take precautions against exposures to these chemicals.

For many other chemicals, studies have not yet been done on workplace exposures and the cancer risk of women. Because cancer biology is similar in people and laboratory animals, animal studies are one of the important tools used to identify chemicals that may be a cancer risk for humans (see *Laboratory Animal Studies*).

## Occupational Studies in Women

**Formaldehyde** – Most studies on formaldehyde exposure in the workplace and cancer risk have been done in men. In women exposed to formaldehyde, two studies have shown a higher risk of developing or dying of breast cancer. Because of overall evidence of increased risk of several types of cancer, and potential exposure in fire scenarios, it is important to take protective action to minimize exposure to this chemical.

**Benzene** – Breast cancer risk was higher in several large-scale studies of women working in jobs exposed to high levels of benzene (as an organic solvent). More studies are needed on whether benzene inhalation in other professions affects the risk of breast cancer.

## Laboratory Animal Studies

The National Toxicology Program has found the following chemicals to be capable of inducing mammary tumors in long-term cancer studies conducted in rats and mice. All of these chemicals can be generated in various fire scenarios.

- Benzene
- 1,3-Butadiene
- Isoprene
- Methylene chloride
- 1,2,3-Trichloropropane
- 2,4-Toluenediamine
- 2,4-Toluene diisocyanate
- 2,6-Toluene diisocyanate

### Authors

**Nellie J. Brown, M.S., C.I.H.**

Director, Workplace Health & Safety Programs  
Cornell University School of Industrial and  
Labor Relations

**Suzanne M. Snedeker, Ph.D.**

Associate Director of Translational Research  
Cornell University Sprecher Institute for Comparative  
Cancer Research  
Program on Breast Cancer and  
Environmental Risk Factors (BCERF)

### Acknowledgements

**Funding:** Support for development of this brochure was provided by the New York State Department of Health, and the Department of Environmental Conservation. The content of this brochure is the sole responsibility of the authors, and does not necessarily reflect the views of our funders or Cornell University.

**Photographs:** Permission to use photographs of firefighters in this brochure granted by Gina Marozzi.

**Layout and Design:** West Hill Graphics, Ithaca, NY.

The authors would like to acknowledge the helpful comments on drafts of this brochure from Fire Service Women of New York State, and staff from the New York State Department of Health's Center for Environmental Health.

**Copyright:** Print and electronic publications of the Cornell Program on Breast Cancer and Environmental Risk Factors (BCERF) are copyrighted by Cornell University ©2008. We encourage the use and distribution of BCERF and publications with the following stipulations: 1) use is for educational purposes only, and 2) credit is given to BCERF and original authors, illustrators and photographers. Reproduction or distribution in whole or in part of any BCERF print, graphic or electronic material for commercial use is strictly prohibited. Any other use, reproduction or distribution is forbidden without the written consent of the original authors.



Printed on recycled paper with soy inks.

BCERF *Alert* for...

## Women Firefighters

### Chemical Exposures in Your Workplace and Breast Cancer Risk

There are many risk factors for breast cancer. Exposures to certain chemicals have been identified as possible risk factors for breast cancer. Exposure to some of these chemicals may occur during firefighting activities.

This brochure is designed to help you understand how you may be exposed to these chemicals in your work, and encourages you to use proper protection to minimize exposures during all phases of firefighting.



Cornell University  
Sprecher Institute for  
Comparative Cancer Research

Program on Breast Cancer and Environmental Risk Factors (BCERF)  
Vet Box 31 • Cornell University • Ithaca, NY 14853-6401  
Phone: 607 254-2893 • Fax: 607 254-4730  
E-mail: [breastcancer@cornell.edu](mailto:breastcancer@cornell.edu) • <http://envirocancer.cornell.edu>



# Protection is Prevention

Personal protective equipment, especially Self-Contained Breathing Apparatus (SCBA) needs to be worn at all phases of firefighting, since there may be potential exposure to chemicals that may increase breast cancer risk in all types of non-structural and structural firefighting activities.



## Structural Fires

### Overheating

**Isocyanates** – generated from polyurethane found in mattresses, sleeping bags, clothing, foam, upholstered furniture and paints.

**2,4-Toluenediamine** – generated from thermal decomposition of foam made from toluene diisocyanate (see *isocyanates* above).

**1,2,3-Trichloropropane** – generated from thermal oxidative degradation of “Tris,” a flame retardant that was used on fabrics.

### Smoldering Combustion

**Benzene** – generated from epoxy resins, and the decomposition of polyester foam and fiberfill found in bedding and upholstery. Generated from polyvinyl chloride (PVC) used as coating on wire and cables, in electrical equipment, and in window treatments (drapes and blinds) and wall coverings.

**1,3-Butadiene** – detected in smoldering, structural fires.

**Formaldehyde** – released from permanent press finishes on fabric treated with melamine-formaldehyde resins, and from simple acrylics found in paints and bed clothing, and epoxy coatings.

**Isocyanates** – generated from polyurethane found in mattresses, sleeping bags, clothing, foam, upholstered furniture, and paints.

**Isoprene** – released from the pyrolysis of natural rubber.

## Non-Structural Fires

### Fire Training Exercises

**1,3-Butadiene** – released from the cellulose and other components found in wood.

**Benzene** – detected in smoke released during fire training exercises involving buildings or motor vehicles (see *Smoldering/Flaming Combustion and Tire Fires*).

### Forest Fires, Wildfires & Brush Fires

**1,3-Butadiene and Isoprene** – released from wood during smoldering combustion, active pyrolysis (flaming combustion), and overhaul activities.

**Benzene and Formaldehyde** – detected in the smoke of burning wood.

### Flaming Combustion (Knockdown)

**Benzene** – detected in smoke from house and municipal fires. Generated from thermal decomposition of polypropylene plastics used in housings of small kitchen, bathroom and office appliances; from polyester found in bed sheets, mattresses, carpeting and clothing; and from polyvinylchloride (PVC) used as a coating for wires and cabling, in plastic switches, wallpaper, and window treatments (drapes and blinds), and PVC plumbing.

**1,3-Butadiene** – detected in smoke from municipal structural fires.

**Formaldehyde** – released from permanent press fabric treated with melamine-formaldehyde resins, and from thermal decomposition of polyethylene used in building materials (e.g. some plastic bathtubs).

### Overhaul, Salvage, and Fire Investigation Activities

**Benzene and Formaldehyde** – released during salvage tasks performed during and after a fire; released during overhaul tasks, including pulling apart walls, ceilings and floors, and removing furniture to find and extinguish hidden fires; and released during delayed off-gassing after chemicals adsorbed onto masonry and concrete.

**Methylene chloride** – detected during overhaul of municipal structural fires.

### Oil Fires

**Isoprene** – released from petroleum in oil fires.

### Tire Fires (Vehicle, landfill or monofill tire fires)

**Benzene** – released from styrene-butadiene rubber during smoldering combustion.

