SOLVENTS AND LYMPHOMA

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Founded by lymphoma patients and their families in 1986, Lymphoma Foundation of America is a non-profit charity serving lymphoma survivors and their families with counseling, referrals, support, and information on ways to prevent recurrences of lymphoma.

INTRODUCTION:
SOLVENTS AND LYMPHOMA

Everyone wants to be as healthy as possible. Whether you are a lymphoma survivor who wants to stay in remission, a family member or friend of a lymphoma survivor, or just someone concerned with cancer prevention, this report is dedicated to you.

What are solvents? What is benzene?

A *solvent* is any liquid substance that mixes with other substances and can be used to dilute them, to apply them to surfaces, or to remove them from surfaces. You are familiar with many solvents. Water is one – you may have noticed that hot water can be a more effective solvent than cold water is. You're using water as a solvent when you wash your dog, your laundry, or yourself! Water is safe, and is a natural component of our body tissues, but many of the solvents that we use in our industrialized times are strong chemicals that are not safe. Usually when people speak of solvents they are referring to strong chemical solvents and not to water.

Examples of chemical solvents include acetone, alcohol (various alcohols, not just ethyl alcohol), toluene, xylene, turpentine, perchloroethylene, benzene, and others. All of these solvents are toxic to varying degrees, and when they enter your bloodstream and tissues, they have to be detoxified by your liver and kidneys. During this process, if the exposure is heavy, your kidneys and/or liver may suffer damage. But individual cells are damaged by these solvents as well, including lymphocytes.

The chemical formula for benzene is C_6H_6 – six carbon atoms and six hydrogen atoms. The carbon atoms are arranged in a ring rather than in a straight line. This ring arrangement, which is also shared by some other compounds, including toluene, xylene, and others, is an important factor in benzene's ability to mix with or adhere to other substances, and is related to benzene's toxicity. Xylene and toluene are almost identical to benzene, except that they have other atoms or groups of atoms in place of some of the six hydrogen atoms. Commercially available xylene and toluene are likely to have benzene in them.

Benzene is a clear liquid with a strong smell. In general, the hydrocarbon compounds that have a ring structure have strong odors, and long ago these ring-shaped compounds were nicknamed "aromatic hydrocarbons", so that when a chemist hears the word "aromatic" she thinks of a ring-shaped, toxic compound. It's not a good idea to sniff any of these compounds!

Of the solvents commonly in use, benzene is the one most frequently found to be associated with lymphoma and is the most studied by scientists searching for a link.

Where is benzene found, and where might I be exposed to it?

Benzene is usually manufactured from petroleum. It is found in gasoline (a good reason why your mom told you not to sniff gasoline), in cigarette smoke, in paint thinners, and in many varnishes, paints, and sealers. It is thought that cigarette smoke, including "second-hand smoke", is a leading source of benzene exposure for most people.[1,2] It is now believed that the benzene in cigarette smoke is an important factor in the cancer-causing effect of smoking. Benzene also occurs naturally when other substances are burned, even in forest fires.

Some people are exposed to benzene on the job. This is especially likely in jobs related to the petrochemical (gas, oil, refining, etc.) industries; in the manufacturing of plastics; and in making other substances such as pesticides, dyes, and others.

As recognition has gown concerning the extreme toxicity of benzene, it has become less widely used, but we are still potentially exposed to it through these sources.

Although benzene is toxic to all living creatures, the **Lymphoma Foundation of America recommends that lymphoma survivors take special care to avoid all exposure to paints, paint thinners, gasoline and related products, strong-smelling solvents of all kinds, and cigarette smoke, including "second-hand smoke".**

How much benzene does it take to cause harm?

We are often asked, with regard to toxic exposures, how much exposure is okay or how much is safe. The best answer is that with highly toxic chemicals, it is always best to avoid them altogether when possible.

Benzene has been shown to be toxic and potentially carcinogenic at very low concentrations. In a recent study, researchers found that workers exposed to less than one part per million of benzene in their workplace air had a significant decline in white cells, and that the activity of their blood-forming cells was reduced.[3] EPA (Environmental Protection Agency) allows 0.005 milligrams per liter of benzene in drinking water. Please note that this doesn't mean this is a safe amount; it's just an enforceable amount. EPA states that the safe level for benzine in drinking water is zero.[4] For workplaces, OSHA (the U.S. Occupational Safety and Health Administration) allows only 10 parts per million of benzene in workplace air during a workday[5] - though clearly, there are times in certain workplaces where considerably more benzene is present.

It's best just to stay away from benzene! If you find that you need to use a substance, such as wood sealer, that contains a toxic solvent, use it in a well-ventilated place (outdoors) and inhale as little of it as possible.

How can I tell whether benzene caused my lymphoma?

Please see the section on causation of cancer in our Pesticides Research Report, *Do Pesticides Cause Lymphoma?* It may be difficult to be certain what caused your lymphoma, but if you have worked for any significant period of time in an environment where you were exposed to benzene, the chances that it may have caused disease unfortunately rise.

As scientists learn more about genetics, we are beginning to have access to information about exactly which genes are altered in a cell that then becomes cancerous. Since we don't all have the same genetic configuration, some people are more vulnerable than others to particular causes of cancer. But it is best to avoid toxic exposures and not play roulette with our health.

The scientific articles and study reports that follow show a fairly strong association between benzene exposures and lymphoma. It is even quite possible that benzene contamination of pesticides is responsible for some of the cancer-causing and cancer-promoting effects of pesticide exposures.

More studies on toxic chemical exposures and cancer are needed, but until we have more information – and even after we have it – you can use your awareness of the cancer risks posed by solvents and pesticides to make informed decisions about your health and safety.

- *Susan Osburn*

1. U.S. Department of Health and Human Services. *The Health Consequences of Smoking: A Report of the Surgeon General*. U.S. Department of Health and Human Services, Centers for Disease Prevention and Health Promotion, Office on Smoking and Health, 2004.

2. *Report On Carcinogens, Eleventh Edition - Substance Profiles - Benzene*. U. S. Department of Health and Human Services, Public Health Service, National Toxicology Program.

3. Qing Lan, Luiping Zhang, Guilan Li, Roel Vermeulen, Rona S. Weinberg, Mustafa Dosemeci, Stephen M. Rappaport, Min Shen, Blanche P. Alter, Yongii Wu, William Kopp, Suramya Waidyanatha, Charles Rabkin, Weihong Guo, Stephen Chanock, Richard B. Hayes, Martha Linet, Sungkyoon Kim, Songnian Yin, Nathaniel Rothman, and Martyn T. Smith. Hematotoxicity in workers exposed to low levels of benzene. *Science* 306: 5702, 3 Dec. 2004, 1774-1776.

4. *Consumer Factsheet on: Benzene*. U.S. Environmental Protection Agency (updated Feb. 14, 2005).

5. *Table Z-2, Occupational Safety and Health Standards: Toxic and Hazardous Substances.* U.S. Department of Labor, Occupational Safety and Health Administration.