
Item ID Number 01425

Author Doherty, Joyce

Corporate Author United States Department of Health and Human Service

Report/Article Title Press Release Announcing Possible Link Between Herbicides and Non-Hodgkin's Lymphomas

Journal/Book Title

Year 1986

Month/Day August 14

Color

Number of Images 7

Description Notes Also includes questions and answers to be used by OCC to respond to press inquiries on the agricultural use of herbicides study.

HHS NEWS

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

EMBARGOED FOR RELEASE
4:30 p.m. EST
Thursday, August 14, 1986 (tentative)

National Cancer Institute
Joyce Doherty
(301) 496-6641

A National Cancer Institute (NCI) and University of Kansas study has found that Kansas farmworkers who used herbicides had a higher risk for developing non-Hodgkin's lymphomas than nonfarmers in the state. The farmers, however, did not have a higher than normal risk for soft-tissue sarcomas and Hodgkin's disease, as studies in Sweden had found. The Journal of the American Medical Association published the study results August 15, 1986 (tentative).

Farmers exposed to the herbicides for more than 20 days each year had six times the risk of developing non-Hodgkin's lymphoma compared to nonfarmers. Among these frequent users, those who mixed or applied the herbicides themselves had eight times the risk. These above-normal rates were associated with the use of phenoxy herbicides, especially 2,4-dichlorophenoxyacetic acid (2,4-D). Phenoxy herbicides are frequently used on pastureland and in growing wheat, corn, sorghum, and rice.

Exposure to chemicals in herbicides is widespread in the United States. In addition to farming and forestry use, these chemicals are found in lawn and garden herbicides, blue stain retardants used in sawmills, slime control substances in paper and pulp manufacturing, cutting oils, wood preservatives, waterproofing agents for leathers and textiles, and medications. Phenoxy herbicides were also used in Agent Orange in Vietnam.

Because of scientific and public concern about the chemicals, NCI conducted a population-based, case-control study of three cancers that earlier studies had linked to

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herbicide exposures. The NCI scientists, led by Shelia K. Hoar, Ph.D., collaborated with scientists from the University of Kansas, led by Frederick F. Holmes, M.D. NCI chose Kansas because the farmers frequently use herbicides on wheat, the state's major crop, and because Kansas has a statewide cancer reporting system.

Dr. Hoar and her colleagues studied 424 male residents with soft-tissue sarcoma (133 cases), Hodgkin's disease (121), and non-Hodgkin's lymphoma (170) that had been newly diagnosed between 1976-1982. A panel of three pathologists confirmed the histology of each diagnosis.

The scientists also studied 948 controls from the general white male population of Kansas. In telephone interviews, the subjects or close relatives of deceased subjects were asked detailed questions about farming practices, including herbicide and insecticide use. For a sample of the subjects, the scientists also located herbicide and insecticide suppliers to corroborate exposure information given in the interviews.

The investigators found that, compared to nonfarmers, the farmers had about equal risk of developing soft-tissue sarcoma and a slightly lower than expected risk of Hodgkin's disease. Even after detailed analyses, they found no consistent patterns of excess risk for either of these cancers associated with length of time working or living on a farm, the crop or the acreage farmed, or the duration or frequency of herbicide use.

For non-Hodgkin's lymphoma, the risk was slightly higher (about 30 percent) for all farmers compared to nonfarmers. The risk, however, increased significantly for farmers who used herbicides. Compared to nonusers, the risk increased to sixfold (600 percent) for farmers who were exposed to herbicides for more than 20 days per year. The level of risk was not related to the total years of herbicide use.

Farmers who began using the herbicides before 1946 had a greater than 70 percent higher risk for non-Hodgkin's lymphoma compared to farmers who began use in the 1950s and 1960s. Use of insecticides did not increase the risk for non-Hodgkin's lymphoma.

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The farmers who did not use protective equipment (gloves, masks, etc.) while using herbicides had a 40 percent higher risk for non-Hodgkin's lymphoma than those who protected themselves. Similarly, farmers who used spray equipment that exposed them to more of the chemicals had an 80 percent higher risk than those who used safer application methods.

The scientists also investigated possible causes for the above-normal non-Hodgkin's lymphomas other than the herbicides. They assessed the more established factors such as immune-altering conditions and drugs and the family history of cancer. They also assessed speculative factors such as cigarette smoking, coffee consumption, and ionizing radiation. None of these was found to change the herbicide association.

The finding of excess non-Hodgkin's lymphoma associated with herbicide use in this study is consistent with earlier research done in Sweden and in some other U.S. states with heavy concentrations of agriculture.

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The following Questions and Answers are to be used by OCC to repond to press inquiries on the agricultural use of herbicides study.

They are not part of the press release.

QUESTIONS AND ANSWERS

1. What types of herbicides were evaluated in this study?

The scientists evaluated the use of phenoxyacetic acids, triazines, amides, benzoics, carbamates, trifluralin, and uracils. The farmers also reported nonspecific herbicide use such as liquids, sprays, and dusts.

2. Were insecticides also evaluated?

Yes, the scientists asked detailed questions about use of insecticides. After they accounted for the herbicide use, they found no association between insecticide use and non-Hodgkin's lymphoma.

3. Dioxin contaminants are found in some herbicides. Did this study find any effects of dioxin in the herbicides?

The study subjects reported most frequent use of 2,4-dichlorophenoxyacetic acid (2,4-D), an herbicide that does not contain 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), the most carcinogenic dioxin isomer. The herbicide 2,4-D, however, may contain other, less toxic dioxin isomers. Very few subjects reported that they used 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), the herbicide known to be contaminated by the carcinogenic dioxin isomer, so the dioxin effects could not be effectively evaluated.

4. Are current herbicide and insecticide formulations safe if used as directed?

Unknown. Until enough time has elapsed to allow for the latency period of non-Hodgkin's lymphoma, the risks for use of current formulations will not be known. If the risks continue to drop, one can assume that current formulations, if applied according to directions, are safer than in the past. The farmers who began using the herbicides before 1946 had a higher risk than those who began their use later; however, even those who began to use the herbicides after 1965 had almost twice the expected number of lymphomas.

5. Do homeowners who use insecticides and herbicides on their property run a higher risk for cancer?

This study did not show any excess risk associated with reported home or garden use of either insecticides or herbicides. NCI is currently collaborating with the University of Nebraska on a new study investigating this question.

6. What precautions can a farmer or homeowner use to protect against possible cancer risks?

Although not designed to answer this question, the study did show that the risk for lymphoma decreased when the farmers used protective equipment to minimize their exposure to the herbicide. Homeowners should do the same. Most chemicals for home or garden use have warnings on labels about how the products should be used.

7. What about the danger to small children and pets who play on lawns that have been treated with herbicides or insecticides?

The population studied was adults only. It did not address risks for children.

8. Do Vietnam veterans who were exposed to Agent Orange have an increased risk for developing cancer?

This study focused on agricultural use of herbicides. The methods of application, the amounts used, the climate, and the elimination of herbicides from the environment, might be very different in Kansas and Vietnam. Studies of Vietnam veterans to date do not report excess non-Hodgkin's lymphoma; however, these studies have been too small to detect moderate excesses, if they exist.