CUTT

A Healthy Ecosystem

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The Impact of 2,4-D on Breast Cancer

2,4-D (2,4-dichlorophenoxyacetic acid) is one of the most widely used herbicides in the United States. 2,4-D belongs to the group of related synthetic herbicides called chlorophenoxy herbicides. The chemical structure of 2,4-D resembles indoleacetic acid, a naturally occurring hormone produced by plants to regulate their own growth. This resemblance allows 2,4-D to artificially regulate plant growth. While 2,4-D itself is rapidly broken down in the soil, 2,4-D preparations made before the mid-1970s were often contaminated with more persistent chemicals called dioxins.

History

2,4-D was originally developed in 1941 to increase plant growth. Soon, it was discovered to have an even more useful role in agriculture as an herbicide to control weed growth. A mixture of 2,4-D and a related chemical called 2,4,5-T was found to be a more effective herbicide than 2,4-D alone. This mixture was called Agent Orange and was used by the U.S. during the Vietnam War to increase the visibility for war planes by destroying plant undergrowth and crops. The usage of 2,4-D and 2,4,5-T increased through the next 15 years. In response to its potential to cause cancer and other health concerns, use of 2,4,5-T was banned by the U.S. Environmental Protection Agency (EPA) in 1983.

Current Use

During the early 1990s, 42 million pounds of 2,4-D were used per year on U.S. croplands making it the fourth most used herbicide in U.S. agriculture. At the same time, the annual use of 2,4-D in New York State was estimated to be 141,665 pounds, making it the seventh most used herbicide in this state. 2,4-D's primary use in agriculture is to control weeds in wheat and corn fields. It is used, but much less so, in orchards to prevent fruits from dropping prematurely. 2,4-D has many nonagricultural uses. It is used to control weeds in forests, rangelands, pastures, parks, athletic fields, golf courses, ponds, and lakes, and to clear land for roadways and rail tracks. In addition, it is used in home lawns and gardens to control broadleaf weeds like dandelions. The EPA has estimated that 12 to 28 million pounds of 2,4-D are used each year in nonagricultural settings.

Animal Cancer Risk

2,4-D fed to laboratory mice over long periods of time did not cause tumors. One study observed an increased incidence of a type of brain tumor called "brain astrocytoma" in male rats fed 2,4-D for two years. However, these results could not be repeated in a second study on rats that were fed higher doses of 2,4-D.

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2,4-D

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In a highly debated study, a small increase in the incidence of a type of blood cancer called canine lymphoma was observed in pet dogs of owners whose lawns were frequently treated with 2,4-D. This increase was seen only in the dogs that were allowed access to areas that had been treated with 2,4-D. However, this study relied on homeowners to remember the pesticides that they had used years ago, and was criticized for the lack of information on the actual exposure of the dogs to 2,4-D and other lawn chemicals.

2,4-D may act with other carcinogens to "promote" lung tumors in mice. Urethan is a known carcinogen. Mice that were exposed to a commercial formulation of 2,4-D in drinking water, followed by an injection of urethan, developed more lung tumors than the mice that were injected with the same carcinogen, but not given 2,4-D.

Human Cancer Risk

There are no reports that indicate a direct link between 2,4- D exposure and cancer in humans. However, there is some concern about higher rates of a type of cancer called non-Hodgkin's lymphoma among farmers, agricultural workers, manufacturing workers, and pesticide applicators who were previously exposed to 2,4-D. But results from different studies are not consistent. While one half of the studies indicated higher rates of non-Hodgkin's lymphoma among populations exposed to 2,4-D, the other half did not.

Often in these studies, 2,4-D exposure was accompanied with exposure to many other chemicals, including other pesticides and dioxin contaminants of 2,4-D. This makes it difficult to assess whether exposure to 2,4-D, some other chemical, or another factor caused the increase in cancer rates reported in some of the studies. The incidence of non-Hodgkin's lymphoma needs to be followed further in studies of workers who were exposed to 2,4-D during its manufacture or application.

Most studies have not found a relationship between exposure to the group of chlorophenoxy herbicides and the development of a type of cancer called soft-tissue sarcoma in humans. These studies did not look at exposure to 2,4-D alone, but included populations exposed to 2,4-D and other related herbicides.

Conclusions

Current evidence does not indicate that exposures to 2,4-D are linked with an increase in the incidence of breast cancer in humans or in experimental animals. The few studies of women who were exposed through their occupation to 2,4-D and other chemicals have not shown an increase in the incidence of breast cancer. 2,4-D fed to experimental animals over long periods of time did not cause an increase in the incidence of breast tumors. There is very limited evidence that 2,4-D can act as a tumor promoter and affect the immune system. Further studies are needed to understand these mechanisms and to determine if they affect breast cancer risk.

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