

Prostate Cancer and Agricultural Pesticides

Risk of prostate cancer increases with frequent use of methyl bromide.

Prostate cancer is the most common cancer (other than nonmelanoma skin cancer) in Iowa men. Despite its common occurrence, we know little about its causes. The most consistent risk factors reported are age, family history, African-American ethnicity, and hormonal factors. Farming has been the most consistent occupational risk factor for prostate cancer.

We examined the exposure-response relationship between 45 important agricultural pesticides and prostate cancer incidence in 55,332 male pesticide applicators from Iowa and North Carolina with no prior history of prostate cancer, while controlling for known risk factors. The follow-up period for case evaluation averaged 4.3 years, covered the years 1994 through 1999, and involved 566 prostate cancer cases.

Compared with the general population of Iowa, Iowa commercial pesticide applicators had a 41% excess risk of prostate cancer and Iowa private applicators had a 27% excess risk.

Nineteen percent of the prostate cancer cases reported a family history of this cancer among first-degree relatives (fathers, brothers, and sons), compared with 8.6% of noncases. This twofold relative risk was consistent with previous reports in the literature. Furthermore, a greater than expected increase in prostate cancer was seen when evaluating those with both specific pesticide exposure and a positive

family history of prostate cancer. These pesticides included several widely used insecticides (chlorpyrifos, coumaphos, fonofos, phorate, and permethrin for animal use) and an herbicide (butylate). Five have a common chemical structure. These findings may suggest that these six pesticides interact with a particular form of one or more genes shared by men with a family history of prostate cancer, making them more susceptible to developing the disease.

Among the 45 individual pesticides examined, only methyl bromide showed a significant dose-response relationship with prostate cancer risk (Figure 1). This was seen overall, as well as in North Carolina private applicators, Iowa private applicators, and Iowa commercial applicators. Because Iowa applicators used methyl bromide in lesser amounts, none of them were classified in the highest exposure category. The risk of prostate cancer rose as the total number of days of methyl bromide use increased. These data suggest that if methyl bromide is responsible for an elevated prostate cancer risk, it may be so only among those with relatively frequent use. In the United States in 1997 approximately 27,000 tons of methyl bromide was used primarily for soil fumigation (87%), but also for commodity and quarantine treatment (8%) and structural fumigation (5%). The National Institute for Occupational Safety and Health considers methyl bromide to be a potential occupational carcinogen.



www.aghealth.org

The Agricultural
Health Study
seeks to identify
factors that
promote
good health.

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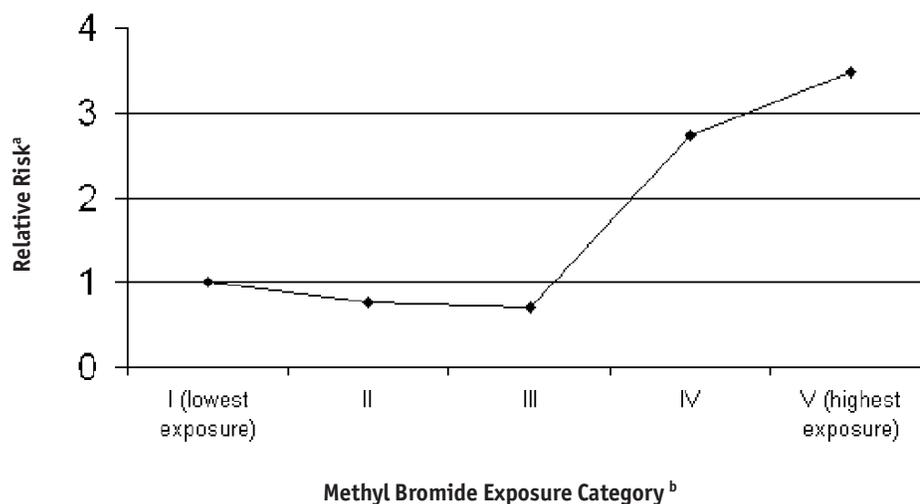
Collaborating Partners:

Iowa State University Extension
Iowa Department of Agriculture
and Land Stewardship

As the study continues, and the participants age, more cases of cancer will develop. With time, the researchers will be able to confirm or refute the current findings, assess additional relationships between exposures and disease, and search for possible genetic

links to the variety of environmental exposures in the farming community. Further information about these and other findings from the Agricultural Health Study can be found on the study website at www.aghealth.org.

Figure 1. Methyl Bromide Exposure and Relative Risk of Prostate Cancer, Agricultural Health Study, 1994-1999



^a All relative risks are computed with nonusers of methyl bromide as the comparison group. They are adjusted for age and family history of prostate cancer. The relative risk is the ratio between the risk of prostate cancer among users of methyl bromide and the risk of prostate cancer among nonusers.

^b I=0.1-33.3 percentile of use, II=33.4-66.7 percentile of use, III=66.8-83.3 percentile of use, IV=83.4-91.6 percentile of use, and V+>91.6 percentile of use.

The Agricultural Health Study is a long-term study to investigate the effects of environmental, occupational, dietary, and genetic factors on the health of the agricultural population. This study will provide information that agricultural workers can use in making decisions about their health and the health of their families. The study is conducted in Iowa by the Department of Epidemiology at the University of Iowa and in North Carolina by Battelle CPHRE. The study is directed by the National Cancer Institute, the National Institute of Environmental Health, and the US Environmental Protection Agency.

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