

Retinal Degeneration in Licensed Pesticide Applicators

Retinal degeneration related to fungicide use.

Retinal or macular degeneration is damage or breakdown of the retina of the eye, causing central vision to be reduced or lost. This condition is the leading cause of blindness in older adults. The risk of developing retinal degeneration increases with age and is greater for women than men. Other factors that may be related to the condition include light eye color, hypertension, diabetes, and sun exposure, but little is known about the role of exposure to occupational or environmental toxins. Some studies of animals suggest that exposure to organophosphate insecticides or fungicides may damage the eye.

To investigate the relationship of retinal degeneration to pesticide exposure, we used information from the Agricultural Health Study, a long-term study of licensed pesticide applicators in Iowa and North Carolina.

Information from questionnaires completed at the time of enrollment in 1994–1997 was used to compare pesticide use in 154 applicators who reported retinal degeneration and 17,804 applicators who did not. Most of the participants in this retinal degeneration study were farmers (99%) and most were white males (97%).

The findings of our study generally suggested that some types of farming and use of some pesticides were related to retinal degeneration. For example, farmers who raised orchard fruit (apples or peaches) were more likely to report this condition. Retinal degeneration was also more likely in farmers who raised Christmas trees or peanuts. Repairing equipment used for pesticide application was related to retinal degeneration, but other farming activities that did not involve pesticides were not related to the condition.

Retinal degeneration was

- **More common in applicators who used fungicides—chemicals used to control fungi and prevent rot on crops. Results were similar in North Carolina and Iowa.**
- **More common in applicators who had used organochlorine pesticides—a group of insecticides, including aldrin and DDT, which are mostly no longer in use.**
- **Not clearly related to other pesticides.**



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The study's most important finding is that retinal degeneration was consistently related to fungicide use. This relationship was seen in farmers from both Iowa and North Carolina. Farmers who had used fungicides for more days over their lifetime were more likely to report the condition than those who had used fungicides for fewer days.

Also, applicators who used certain methods to apply fungicides were more likely to have retinal degeneration. These methods—hand spray gun, backpack sprayer, and mist blower—may all involve greater contact with the fungicide than other methods, such as tractor boom. Using personal protective equipment did not seem to reduce the likelihood of developing retinal degeneration, although our study did not have enough information to resolve this issue conclusively. In particular, the condition seemed to be related to exposure to the whole body, not necessarily to the eye, and was not reduced by using goggles or face masks.

The relationship of retinal degeneration to raising orchard fruit (described above) was seen only in farmers who used fungicides. Orchard farmers who did not use fungicides were not more likely to have retinal degeneration. This finding suggests that the condition is related to using fungicides, not to raising orchard fruit.

The relationship of retinal degeneration to insecticide use that we found in our study is similar to relationships found in other studies of humans and animals. However, this study is the first study in humans to report a relationship of retinal degeneration to fungicide use. Because no one study alone can fully answer a question, more work needs to be done to determine whether this relationship will hold up. Epidemiology studies like ours report a statistical association that needs to be confirmed by additional epidemiology studies, as well as animal and mechanistic studies, before we can determine whether fungicide use actually causes retinal degeneration.

For further information about this study, please visit the Agricultural Health Study Web site at www.aghealth.org.

Kamel F, Boyes WK, Gladen BC, Rowland AS, Alavanja MCR, Blair A, Sandler DP. Retinal degeneration in licensed pesticide applicators. American Journal of Industrial Medicine 37:618-28, 2000.

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

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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