



Breast Cancer Risk and Wide-Area Pesticide Use on Cape Cod

Applying new geographic information system (GIS) technology developed for the study, the Cape Cod Breast Cancer and Environment Study investigated whether exposure to pesticides from wide-area application is associated with higher breast cancer risk.

Results, published in *Environmental Health Perspectives*, show no consistent or strong pattern of association between breast cancer and pesticides used for tree pests, cranberry bogs, other agriculture, mosquito control on wetlands, golf courses, or rights of way management.

When certain types and time periods of pesticide use were evaluated, though, the study found limited evidence of some associations. Breast cancer risk was somewhat elevated – about 20 to 80% higher -- for women who lived:

- in or near areas treated for tree pests in 1948-1995
- near cranberry bogs in 1948 to the mid 1970s, and
- near agricultural land since the mid 1970s.

The estimates of increased risk were statistically unstable and most did not reach the traditional statistical significance standard of $p < .05$. The analyses take into account established breast cancer risk factors.

Results showed no higher breast cancer risk associated with living near wetlands sprayed for mosquitoes, near cranberry bogs in more recent years, or near agricultural lands before the mid 1970s.

Differences in results for different categories of pesticide use may be due to differences in exposure from aerial versus ground-based application or chemigation (application via irrigation systems). Aerial application was common for tree pests and cranberry bogs in the earlier years, with a shift to greater use of chemigation, which may reduce the extent of aerial drift, for cranberry bogs in the 1980s. Alternatively, differences in observed risks across different pesticide categories may be due to the mixtures of chemicals used or frequency of application, or due to chance. Now-banned persistent organochlorine pesticides were typically used on Cape Cod from 1948 to the mid 1970s, with less persistent (and perhaps less toxic) compounds used in more recent years. Cape Cod switched to biological rather than chemical control of mosquitoes in the early 1970s.

The study interviewed 1165 Cape Cod women diagnosed with breast cancer in 1988-1995 and 1006 comparison women who were similar in age. Researchers mapped the women's Cape Cod addresses dating back to 1948 when DDT was first used on Cape Cod and linked interview

responses to GIS data that reconstructed the history of pesticide use. Using new technology developed for the study, the researchers estimated women's pesticide exposure at each address for each year based on the distance to spray areas, wind direction, and other factors. Some limitations of the study include lack of information about women's exposures during years they lived off Cape Cod, lack of follow-up with girls and women who moved away, and unrecorded town and private pesticide spraying.

Laboratory studies show three biological mechanisms that may link chemicals -- including pesticides -- and breast cancer.

- Many pesticides can mimic or interfere with hormones, including estrogen, which is known to affect breast cancer risk and cause breast tumor cells to grow.
- A few pesticides are shown to cause mammary tumors in animals.
- In addition, US Environmental Protection Agency scientists recently discovered in animal studies that exposure to the pesticide atrazine during pregnancy affected mammary gland development in female offspring, leaving the daughters permanently more vulnerable to carcinogens. Although atrazine is not typically used on Cape Cod, this mechanism may apply to other pesticides, which have not been similarly tested.

Previous epidemiologic studies of pesticides and breast cancer have been focused on a relatively small number of the pesticides, especially the banned organochlorines, such as DDT. Studies of these pesticides have for the most part shown no association with breast cancer; however, the studies have been limited by relying on recent blood measurements of pesticide residues as indicators of historical exposure. Limitations in epidemiologic studies of breast cancer and pesticides must be addressed in studies of exposure and toxicology.

For additional information about epidemiologic results, refer to:

Brody, J.G., A. Aschengrau, W. McKelvey, R.A. Rudel, C.H. Swartz, T. Kennedy. 2004. Breast cancer risk and historical exposure to pesticides from wide-area applications assessed using GIS. *Environmental Health Perspectives*. doi:10.1289/ehp.6845 [online March 11, 2004]

For additional information about the GIS exposure reconstruction, refer to:

Brody, J.G., D.J. Vorhees, S.J. Melly, S.R. Swedis, P.J. Drivas, R.A. Rudel. 2002. Using GIS and historical records to reconstruct residential exposure to large-scale pesticide application. *Journal of Exposure Analysis and Environmental Epidemiology*, 12:64-80.

Areas where pesticides were applied are shown in the Silent Spring Institute on-line breast cancer and environment atlas at

<http://www.silent.spring.org/newweb/atlas/pesticides/index.html>.

For additional information about Silent Spring Institute and the Cape Cod Study, please visit www.SilentSpring.org.