

## Chapter 11 — Implications of the Review for Family Physicians

This systematic review of pesticide health effects was undertaken to help family physicians and their patients interpret the large body of literature in this area and make effective decisions about prevention efforts. These include patient education, identification of vulnerable groups, risk assessment, and clinical problem solving. We also identified areas where existing information is insufficient to inform clinical decision-making.

Family physicians, and other health professionals who are points of entry for health care, have at least three kinds of responsibilities in dealing with possible pesticide health effects.

### A. Patient Inquiry

*Patients ask questions about their concerns relating to pesticide exposure and potential health consequences.* Their concerns may be related to occupational, home, or environmental exposures. We need good evidence-based information, distilled from methodologically acceptable studies, to answer these concerns, and to provide reassurance, educational intervention, or direction for further investigation into links between exposures and disease or illness. The information in this review is reported by health effect and will be useful in determining whether patients' concerns about specific health effects may be related to pesticide exposure. Because most human studies are of multiple pesticide exposures, the health effects of specific pesticides are still difficult to infer from the literature.

### B. Health Screening

*Patients also come to us for routine preventive care, giving us the opportunity for early intervention if their pesticide exposures are at a level that may cause significant health problems.* Routine functional enquiries on farmers, pesticide applicators, professional gardeners, homeowners with lawns or gardens, floriculturists, and greenhouse workers should include specific questions about frequency, duration, and type of pesticide exposure, as well as about the use of protective gear, and any patient concerns about these exposures. Many studies document neurological, reproductive, genotoxic, and carcinogenic effects of pesticides, both in occupational and domestic settings, and preventive action is warranted for patients who are specifically vulnerable.

### C. Case Finding: Relationship to ill-defined symptoms?

*Finally, patients present with non-specific symptoms—for example, fatigue, dizziness, low energy, rashes, weakness, sleep problems, anxiety, and depression.* An important step in diagnosing such non-specific symptoms is to take an exposure history (1) including pesticide exposures (2). There have been no studies of incidence of pesticide-related illnesses in primary care settings. Many of the studies in this review measure health effects that are subclinical, such as chromosome aberrations. There is a high level of consistency in results to indicate a wide range of pesticide-related clinical and subclinical health effects. Reviewing the literature since 1992, most studies of pesticides as a cause of health effects show a positive association. This is true across diverse areas including hematologic cancers, solid tumours, birth defects, increased time to pregnancy (a measure of couple fertility), neurological diseases, skin reactions, and genotoxic effects on lymphocytes.

## **Which pesticides are most harmful?**

The results of the systematic review do not help indicate which pesticides are particularly harmful. Exposure to all the commonly used pesticides — phenoxyherbicides, organophosphates, carbamates, and pyrethrins — has shown positive associations with adverse health effects. The literature does not support the concept that some pesticides are safer than others; it simply points to different health effects with different latency periods for the different classes. Triazine herbicides increased breast cancer risk (3). Carbamate and phenoxyherbicide exposure increased lung cancer risk (4). Spraying of an organophosphate during pregnancy caused deterioration in placentas (5). Indoor use of insecticides was associated with brain cancer and acute lymphocytic leukemia in children (6, 7). Six pesticides, including 2,4-D and Dicamba, were associated with increased time to pregnancy (8). Fungicide exposure had positive associations with dermatitis (9, 10, 11).

Some more surprising positive associations were found for pesticides that are considered less toxic in acute poisoning settings. For example, pyrethrins were associated with chronic psychiatric effects (12), chromosome aberrations (13), rashes in licensed pet groomers (14), and intrauterine growth retardation, which is a major determinant of health in the first year of life (15). The herbicides glyphosate and glufosinate had associations with congenital malformations (16, 17). Parental preconception exposure to glyphosate was associated with late abortion (18).

## **Reducing exposure is the best advice**

Given the wide range of commonly used home and garden products associated with health effects, our message to patients should focus on reduction of exposure to all pesticides, rather than targeting specific pesticides or classes. Such exposure reduction efforts could include: supplying information about organic methods of lawn and garden care and indoor pest control, education about the high skin absorption of pesticides, and instruction in the use of respirators for home and occupational exposures. For patients with occupational exposures, the history should include use of personal protective equipment, and timing of re-entry into recently sprayed work settings (19, 20). Information from a number of studies suggests that the use of protective equipment reduces exposure and health effects.

## **Vulnerable patient groups for pesticide health effects**

Pregnant women are a special risk group, given the findings showing increased risk of childhood acute lymphocytic leukemia when women use pesticides in the home and garden during pregnancy (7). Women who intend to become pregnant need specific information about avoiding pesticide use in their homes, gardens, and workplaces.

Children are another very important group with specific vulnerability to pesticides. Family doctors need to consider possible pesticide exposures, which can occur by take-home exposures from a parent's workplace, use of pesticides on lawns, gardens, schoolyards, and parks, or by treating/spraying pets or homes (see Chapter 10 for a more detailed discussion of the vulnerability of children).

We have reported on many studies showing excess cancer risk in children exposed directly or indirectly to pesticides. These associated cancers include: brain cancer (6, 21), kidney cancer in offspring of occupationally exposed men (22), and excess acute lymphocytic leukemia in children whose mothers used pesticides in homes and gardens during pregnancy (7). In spite of

the important concern that pesticides may be toxic to the developing nervous system, only two studies (both positive) specifically examined neurological effects in children (12, 23). Reproductive effects of concern include increased miscarriage, fetal death, infertility, IUGR, and birth defects (see Chapter 9).

The elderly also have chronic neurological diseases that have been related to long-term pesticide exposure. These include Parkinson's disease, amyotrophic lateral sclerosis, and Alzheimer's disease (Chapter 8). All these diseases are difficult to treat, which highlights the importance of prevention by reducing lifetime pesticide exposure.

## **Prevention and education opportunities for family doctors**

Making a correct diagnosis that leads to effective treatment is still one of the enduring rewards of family practice. Consider pesticide exposure in your differential for recurring rashes and other non-specific symptoms, and that satisfaction may be yours.

There is little satisfaction for a family doctor in knowing that a patient's infertility, tumour, or Parkinson's disease was probably caused by pesticide exposure. The severity of many pesticide-related illnesses is a reason to focus on prevention rather than diagnosis.

Patients trust family doctors as a source of information on environmental questions (24). We need to earn this trust by informing ourselves: first about high-risk groups in our practices, then about methods to reduce pesticide exposure for women of childbearing age, occupationally exposed patients, and most importantly, children. Our offices can be used to promote reduction of pesticide use by our patients, and improved use of personal protection for those who choose to work with pesticides. We can promote community-based solutions by involving ourselves in the promotion of municipal bylaws aimed at reducing the cosmetic use of pesticides. Our concerns about health effects of pesticides can be transmitted to politicians who are making regulatory decisions which impact public health. We can be an important voice in encouraging our hospitals to stop using pesticides on lawns, and our schools to stop spraying areas where children play. We can promote the use of the precautionary principle in the area of pesticide use. This principle asserts "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully understood" (25).

## **What we can do**

1. Correctly diagnose and treat acute and chronic pesticide health effects.
2. Emphasize prevention vs. retrospective case-finding for chronic or terminal disease
3. Inform ourselves about pesticide health effects and consider high-risk groups in our practices.
4. Advocate reduction of risk to or use by individual patients.
5. Advocate reduction of use in the community, schools, hospitals, and to governments.

## **Why we should do it**

Very few of our patients willingly expose themselves to harmful chemicals, but information about pesticide health effects is not common knowledge, and we are in an excellent position to make it so. Strong one-to-one messages from health care providers about the potential harm from

pesticide exposure are an effective way to inform our patients. The evidence for harm is strong, and just as the public became aware of the health risks of smoking over decades of education, we now have an important role in heightening awareness of the risks of pesticide exposure.

In 2003, well-known non-Hodgkin's lymphoma researchers Hardell and Erikson (26) published a careful analysis of the decline in this disease in countries where the herbicide 2,4-D has been banned for over ten years. Their analysis concluded that 5% (3.0–7.7%) of NHL is attributable to chlorophenoxy herbicide and chlorophenol exposure. If this level of attributable risk is similar for even some of the other tumour–pesticide associations, it is clear that a concerted effort by physicians to reduce patients' pesticide exposures could produce measurable reductions in cancer. Stronger intervention at the regulatory level, such as the province-wide cosmetic pesticide ban instituted by the Government of Quebec in 2003, could well prove to provide important cost savings to the health care system. Even in the absence of cost reductions, the smallest reduction in incidence of non-Hodgkin's lymphoma, childhood leukemia, or brain cancer would reduce human costs and be a cause for celebration.

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