

# Occupational Medicine Clinical Update

*Dedicated to the prevention of occupational illness and injuries, and promoting the well-being of all workers*

## Occupational Health Clinics for Ontario Workers Inc, Sarnia-Lambton

### Pesticide Primer

#### This Issue:

- Case Report—Acute Pesticide Toxicity
- Sources of Exposure
- Summary of Diseases Linked with Pesticides
- The Limits of Epidemiology
- The Precautionary Principle



*Being close to spring, when pesticide companies are advertising to convince people to sign up for lawn maintenance programs, it seemed timely to address some of the issues related to pesticides.*

*Much of the furor over this topic has been fueled by a Supreme Court ruling which allowed municipalities the right to limit or ban the use of these chemicals in their jurisdictions.*

*This ruling has ignited a huge public relations campaign by the pesticide manufacturers, particularly the makers of the herbicide 2,4-D, who stand to lose substantial sums of money from this billion dollar industry.*

*Sarnia City Council has just completed a review of its policy on the use of these substances. Council voted to reduce use and increase education about pesticides, rather than an outright ban.*

*This month's issue will focus on who is at risk, what the potential risks are, and where the limits of epidemiology are being manipulated to fuel the fire on one of the most contentious issues in the domain of public health since cigarette smoking.*

*The aim of this very brief summary is to provide a framework for approaching the sea of information on this vast and highly controversial topic.*

#### Worker Re-Entry Poisoning, California 1998 [Levy, 2000]

In July 1998, 34 workers entered a cotton field sprayed two hours earlier with carbofuran. The EPA restricted entry interval (REI) for this compound is 24 hours. After 4 hours of weeding the workers became ill. Over 80% reported nausea, headache, eye irritation, dizziness and muscle weakness.

Thirty of the workers were taken to hospital, the other four eventually sought treatment.

Management was: 1) worker decontamination 2) clinical observation 3) treatment with atropine for severe symptoms 4) removal from work 5) diagnosis and documentation of pesticide-related illness: a) cholinesterase monitoring b) urinary metabolite analysis c) foliar residue sampling.

The editors of MMWR noted that "failure to adhere to an REI can result in substantial morbidity among exposed workers," and that "sole reliance on these measures may be inadequate, the substitution of safer, less toxic alternative pesticides should be adopted when feasible."

Below are tables summarizing the potential sources of exposure to pesticides both at and outside of work [Zahm, 1997].

Physicians should know that WHMIS data is not required for pesticides, thus there are no MSDS sheets for doctors dealing with these occupational emergencies.

#### Occupational Groups Potentially Exposed to Pesticides

Farmers/Farmworkers	Herbarium curators
Pesticide manufacturers/Formulators	Custodians
Pesticide mixers and loaders	Nursery and green house workers
Agricultural pesticide applicators	Wood preservation workers
Crop duster pilots/Flaggers for pilots	Chemical lawn care workers
Food processors	Golf course/park/landscape workers
Packing house workers	Highway, railway bed workers
Fumigation workers	Mosquito abatement workers
Grain millers	Textile workers
Forestry workers	Pulp and paper workers
Veterinarians/Pet groomers	Paint manufacturers
Structural pest control operators	Morticians

#### Non-Occupational Sources of Pesticide Exposure for the General Population

Agricultural application drift, overspray
Agricultural application off-gassing, volatilization
Ground/surface water contamination; Soil/food contamination
Pollution from manufacturing sources
Indoor air contamination at homes, schools, office, aircraft, other
Homeowner indoor pest/lawn and garden pest control application
Drift from lawn and garden pest control application
Drift from public land maintenance and insect control
Recreational areas such as golf courses and parks
Pet products
Leaks, spills, accidents
Disposal sites

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## Health Effects of Pesticides in Humans

System	Associations from Studies
Cancers	Non-Hodgkin's lymphoma, multiple myeloma, other hematologic malignancies, adult and pediatric leukemias, brain tumours (adult/ped), Wilms' tumour, sarcomas, prostate, breast, thyroid, GI, urinary tract, testicular
Dermatologic	Irritant and allergic dermatitis, chloracne, porphyria cutanea tarda
Respiratory Diseases	Asthma, pulmonary hemosiderosis, chronic-bronchitis, pulmonary fibrosis, Wegener's granulomatosis
Neurological	Acute intoxication; chronic Parkinson's, ALS, peripheral neurotoxicity, neuropsychological deficits
Reproductive	Infertility, spontaneous abortions and stillbirth, cleft lip/palate, limb defects, CVS malformations, spina bifida and hydrocephaly, cryptorchidism & hypospadias
Developmental	Neurodevelopmental delay in children (short-term memory, gross and fine motor coordination, impaired physical stamina)
Immunological	Immunosuppression, possible link to infections; cancers, autoimmune diseases
Endocrine	Thyroid impairment, estrogenic mimics, androgen blockade

### Health Effects of Pesticides (Occupational and Non-Occupational)

The table above gives an overview of the broad range of diseases that have been associated with various pesticides. Possibly, the most comprehensive, current and relatively readable overview of these studies is available on-line. It is entitled Pesticides and Human Health: A Resource for Health Care Professionals [Solomon et al, 2000]. It delves into the specifics of the studies, including their strengths and weaknesses. It appears to be a fairly balanced resource for any physician who might be interested in gaining some insight into this area.

Clearly, there are a wide range of concerns and the evidence is still accumulating. Much of the confusion over the strength of such associations is a result of the paucity of research done, and the limits of what epidemiology can currently show (see discussion below).

### The Limits of Epidemiology

The topic of pesticides and human health is vast and extremely complex, epidemiologically. One of the main difficulties lies in the methodological hurdles in isolating low-level exposures, of multiple types, from multiple sources, and linking them to chronic disease, and those with long latencies. It has been recognized that even with good study designs increased risks of up to 200% can be easily missed.

The tobacco industry took advantage of these weaknesses of science for decades to throw confusion on the health effects of the greatest lifestyle threat to health the world has known. That industry has continued to flourish despite increased risks quoted usually in the range of 10 to 20 times for lung cancer alone.

The recognition that the current tools of epidemiology cannot prove nor rule out many associations led to the adoption of "The Precautionary Principle," [Cameron and Aboucher, 1991] (see box).

### The Precautionary Principle

*"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 have not been fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof."*

An owner of a local insulation firm was recently relating that when it was 'proven' asbestos was responsible for lung cancers and respiratory problems the workers were told, "so don't breathe it, but you can eat the stuff." It is now recognized that asbestos is responsible for a wide range of GI cancers also. We should try to remember that waiting for absolute 'proof' can sometimes cost many lives and dollars, and is sometimes a smoke screen for those who have a product to sell.

### Conclusion

The pesticides are a large group of different compounds that have in common their ability to disrupt biological systems. Many are known to be carcinogens and cause other serious health problems in humans. For many of these, the manufacturers and applicators will argue there is no 'absolute proof' that these are unsafe. However, the contrary can also hold: there is no absolute proof that they are safe, and there are often studies suggesting quite the opposite.

Epidemiological tools currently available cannot answer many of these questions. It will be up to people using information we can trust as unbiased, along with using the lessons of history (when we have assumed substances are safe until proven otherwise: asbestos, PCB's, DDT, blood products, tobacco, etc.), to make thoughtful and responsible decisions. In a hundred years, perhaps, we will be able to apply the retro-spectroscope and measure how good those decisions were.

Perhaps the recognition that science and the limits of epidemiology at this point have been exceeded, and application of ideas such as The Precautionary Principle will result in decisions that we can all live with, both now and in the future.

For those who would like more in-depth information we have a wide range of resources related to pesticides as well as links to web resources. We would be more than happy to provide these for anyone interested.

### References

- Cameron J, Aboucher J. 1991. The Precautionary Principle: A Fundamental Principle of Law and Policy for the Protection of the Global Environment. Boston College International and Comparative Law Review. 14: 1-27.
- Levy BS, Wegman DH. 2000. Occupational Health: Recognizing and Preventing Work-Related Diseases and Injury. Fourth Edition. Philadelphia: Lippincott.
- Solomon G, Kirsch J, Ogunseitian OA. 2000. Pesticides and Human Health. Physicians for Social Responsibility and Californians for Pesticide Reform. 60 pages. www.psrla.org/pesticides/pesticides\_and\_health\_kit.pdf
- Zahm SH, Ward MH, Blair A. 1997. Pesticides and Cancer. Occupational Medicine: State of the Art Reviews. 12 (2):269-289.