

Evolution of Biomarkers for Pesticides: Examples From the Agricultural Setting

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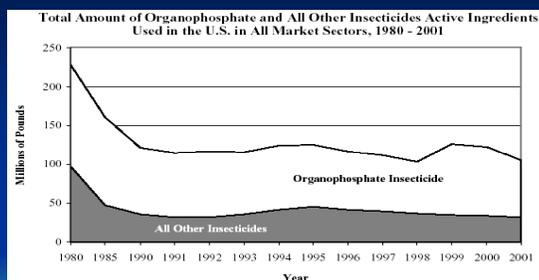
Focus: Organophosphate Pesticides

Reason # 1: Widespread exposure

Recent decreases in home/garden use
(regulatory restrictions and phase outs
based on child health concerns)

Continue to be used heavily in agriculture

70% of insecticide use in 2001 = OP



Kiely T et al. Pesticide industry sales and usage: 2000-2001 market estimates.
U.S. EPA Office of Pesticide Programs, May 2004

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Reason # 2: Acute Toxicity

OP = pesticide type most often implicated in
symptomatic illness reported

Acute Poisoning Data

PESTICIDES MOST OFTEN IMPLICATED IN SYMPTOMATIC ILLNESSES, 1996

| Rank | Pesticide or Pesticide Class | Child < 6 years | Adults 6-19 yrs. | Total* |
|------|------------------------------------|-----------------|------------------|--------|
| 1 | Organophosphates | 700 | 3274 | 4002 |
| 2 | Pyrethrins and pyrethroids** | 1100 | 2850 | 3950 |
| 3 | Pine oil disinfectants | 1336 | 903 | 2246 |
| 4 | Hypochlorite disinfectants | 808 | 1291 | 2109 |
| 5 | Insect repellents | 1081 | 997 | 2096 |
| 6 | Phenol disinfectants | 630 | 405 | 1040 |
| 7 | Carbamate insecticides | 202 | 817 | 1030 |
| 8 | Organochlorine insecticides | 229 | 454 | 685 |
| 9 | Phenoxy herbicides | 63 | 387 | 453 |
| 10 | Anticoagulant rodenticides | 176 | 33 | 209 |
| | All Other Pesticides | 954 | 3604 | 4623 |
| | Total all pesticides/disinfectants | 7279 | 15,015 | 22,433 |

* Totals include a small number of cases with unknown age.

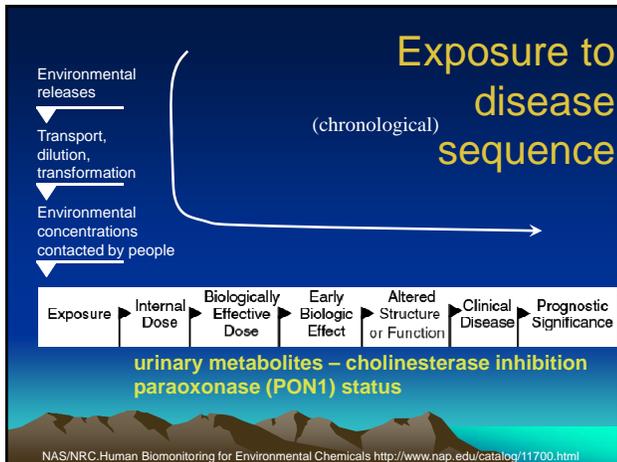
** Rough estimate; includes some veterinary products not classified by chemical type.
Source: American Association of Poison Control Centers, Toxic Exposure Surveillance System, 1996 data.

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Reason # 3: Chronic exposure health
implications

Focus of NIEHS/EPA children's
environmental health centers

Growing evidence of neurodevelopmental
effects with chronic, low level exposure
(non-acute)



Clinical Setting Questions

A parent....
I just read the CDC report and I have learned that my child may have pesticides in her body -- what does this mean? Do I need to have my daughter tested?

A colleague....
I am sensitive to drug X, could this affect my susceptibility to pesticides?

Public Health Sector Questions

A public health officer in a rural community...
Should our healthy family fact sheet include a recommendation for choosing organic foods?

Which populations are most vulnerable to potential adverse health outcomes from pesticide exposure?

A federal agency leader....
Should we have a national medical monitoring program for occupationally exposed agricultural workers?

Risk Assessment Questions

A policy maker asks....

Has the change in regulation of diazinon and chlorpyrifos reduced exposure in at risk populations?

Should regulatory decision making incorporate evaluation and protection of the most genetically vulnerable subset of the population?

Considerations for progress

Stage of validation/utility, limitations, knowledge gaps

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How to increase the clinical, public health and risk assessment relevancy?