

Pesticide Dose Estimates for Children of Iowa Farmers and Non-Farmers

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Epidemiology: November 2006 - Volume 17 - Issue 6 - p S92

ISEE/ISEA 2006 Conference Abstracts Supplement: Session Abstracts: Abstracts

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Introduction:

Farm children have the potential to be exposed to pesticides. Biologic monitoring is often used to assess this exposure; however, the significance of the exposure is uncertain unless doses are estimated.

Methods:

In the spring and summer of 2001, 117 children (66 farm, 51 non-farm) of Iowa farm and non-farm households were recruited to participate in a study investigating potential take-home pesticide exposure. Each child provided an evening and morning urine sample at 2 visits spaced approximately 1 month apart. Estimated doses were calculated for atrazine, metolachlor, chlorpyrifos, and glyphosate from urinary concentrations derived from the spot urine samples and compared with Environmental Agency reference doses.

Results:

For all pesticides except glyphosate, the doses from farm children were higher than doses from the non-farm children. The difference was statistically significant for atrazine ($P = 0.0001$) but only marginally significant for chlorpyrifos and metolachlor ($P = 0.07$ and 0.1 , respectively). The highest doses for atrazine, chlorpyrifos, metolachlor, and glyphosate were 0.085, 1.96, 3.16, and 0.34 $\mu\text{g}/\text{kg}$ per day, respectively. None of the doses exceeded the Environmental Agency chronic reference values for atrazine, metolachlor, and

glyphosate; however, all of the doses for chlorpyrifos exceeded the Environmental Agency chronic population-adjusted reference value. Doses were similar for male and female children. A trend of decreasing dose with increasing age was observed for chlorpyrifos.

Discussion and Conclusions:

There are several limitations in our pesticide dose estimates that are common to the estimation of doses from spot urinary concentrations. First, it was assumed that the spot urine samples were representative of average daily pesticide excretion and that the doses estimate average daily doses. Second, the merits of creatinine adjustment for spot urine samples are being debated, especially in children. Lastly, it was assumed that the amount of pesticide metabolite excreted in urine, after adjusting for the fraction of metabolite excreted, was equivalent to an absorbed pesticide dose. Estimation of pesticide dose from farm children's urine samples allows comparison to Environmental Agency reference doses and therefore provides an indication of the significance of pesticide exposure. Additional longitudinal studies that better estimate daily pesticide doses over the course of a year are needed to truly determine the health significance of pesticide exposures.

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