What, if It Is All Safe? The Need for Pesticide Risk Minimization

Fantke, Peter; Jolliet, O.

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whether differences exist by age, sex, race, and year. Results: We observed demographic differences in urinary concentrations of 3,5,6-trichloro-2-pyridinol and 3-phenoxybenzoic acid. Also, we observed that while urinary concentrations of 3,5,6-trichloro-2-pyridinol follow a downward trend, urinary concentrations of 3-phenoxybenzoic acid appear to be increasing. Conclusions: These results suggest a downward trend in exposure to chlorpyrifos and a reciprocal upward trend in exposure to its alternatives, synthetic pyrethroids, in the United States since the early 2000s. Furthermore, these findings stress the usefulness of biomonitoring as a tool to assess the extent of human exposure to these commonly used insecticides and to track the public health effectiveness of legislative actions to reduce exposure to OP pesticides after phasing out the use of chlorpyrifos.

Keywords: B-pesticides, A-biomarkers, A-biomonitoring

Mo-O-B1-03
What, if It Is All Safe? The Need for Pesticide Risk Minimization
P. Fantke[1], O. Jolliet[2]; [1]Technical University of Denmark, Kgs. Lyngby, Denmark, [2]University of Michigan, Ann Arbor, MI

Abstract: Pesticides authorized in US and EU are considered safe for humans, i.e. below thresholds of acceptable risk. However, pesticides nonetheless contribute to global human disease burden via different effects, some of which are not even included in authorization procedures, e.g. neurodevelopmental disabilities (Lancet Neurol 13: 330). Comparative substitution scenarios combining crop-specific amount applied with pesticide-specific toxicity potential can help to characterize and minimize disease burden from pesticide exposure. We identified intake via food crop consumption as main exposure pathway to pesticides. For this pathway, we quantified health impacts in a dynamic crop uptake model, detailing how pesticides contribute to average burden of 2.6 hours lost per person over lifetime across Europe. Findings show that only 10% of all pesticides applied to grapes/vines, fruit trees, and vegetables account for 90% of total annual health impacts of around 2000 disability-adjusted life years. Main aspect driving crop residue dynamics and parameter uncertainty is thereby pesticide dissipation from crops. To reduce uncertainties in our assessment, we built an inventory of 811 existing experimental studies providing 4500 dissipation half-lives in crops. Realizing that this inventory still covers only a small fraction of possible pesticide-crop combinations, we developed models to estimate dissipation in crops from collected data. We provide reference half-lives for 333 pesticides with reported temperatures applied at 20°C under field conditions and propose a predictive model for pesticides without measured data to estimate half-lives from substance properties at the level of pesticide class. Combining improved dissipation data with quantitative assessments, we demonstrate that health impacts can be reduced up to 99% by defining adequate substitution scenarios. We recommend that future work focuses on pesticides dominating human disease burden, which has policy implications.

Keywords: B-pesticides, C-food, human exposure, health impacts, substitution scenarios, human exposure, health impacts, substitution scenarios, human exposure, health impacts, substitution scenarios

Mo-O-C1: Exposure to Recreational Water Contaminants

Mo-O-C1-01
Rapid Phycocyanin Fluorometry Predicts Elevated Microcystin Levels in Eutrophic Ohio Lakes
J. W. Marion[1], J. Lee[1], C. Lee[1], S. Lemeshow[2], J. R. Wilkins III[3], E. J. Waletzko[4], T. J. Buckley[1]; [1]The Ohio State University, Columbus, OH, [2]The Ohio State University, Columbus, OH, [3]The Ohio State University, Columbus, OH, [4]The Ohio State University, Columbus, OH

Abstract: Current approaches for assessing human health risks associated with cyanotoxins often rely on the quantification of microcystin. Significant limitations of current approaches are cost and time to obtain a result. To address these challenges, a numerical index for screening microcystin risks above the World Health Organization's (WHO) low-risk threshold for microcystin was developed for eutrophic Midwestern U.S. lakes based on water quality results from 182 beach water samples collected from seven Ohio lakes. In 48 (26.4%) samples we observed microcystin concentrations as measured by ELISA that exceeded the 4 µg/L microcystin threshold. A multivariable logistic regression model using practical real-time measures of in vivo phycocyanin (by fluorometry) and secchi depth was constructed to estimate the probability of a beach sample exceeding 4 µg/L microcystin. The final model achieved statistical significance ($p = 0.030$) as well as good calibration and discrimination. These results demonstrate two rapid and practical measures of recreational water quality are