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Abstract

Adding Realism to the Assessment of Occupational Exposure to Pesticides Using Probabilistic Modelling: A Case Study on Aggregate Exposure to Pyrethroids †

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Pyrethroid usage has risen due to restrictions on other insecticides, prompting interest in biomonitoring data as exposure indicators. Occupational exposure, particularly in Plant Protection Product (PPP) applications, is a focus. Regulatory agencies, like the European Food Safety Authority (EFSA), use tools such as OPEX (https://r4eu.efsa.europa.eu/app/opex) (accessed on 2 April 2024) to assess non-dietary exposure, employing mainly worst-case scenarios for increased protection.

This research explores OPEX's suitability for non-regulatory realistic aggregate exposure estimations via probabilistic modeling and Monte Carlo simulations. This study uses as background information/data generated within projects funded by EFSA and is part of a case study under the EU PARC project estimating aggregated pyrethroid exposure. This study uses workflows for operators and workers, integrating tasks and applying Monte Carlo simulations for exposure estimation variability. Probability distributions replace default values, addressing real-world uncertainties.

The intention is to present a conceptual model for three occupational exposure scenarios, highlighting variability in task roles and exposure routes. Monte Carlo simulations offer full probability distributions, aiding sensitivity and uncertainty analyses. This study plans to compare aggregated exposure, including dietary exposure, with some preliminary results. The ongoing project aims to refine default values via a probabilistic assessment strategy.

To conclude, there is a need for aggregate exposure models considering shared neurotoxicity among pyrethroids. The proposed approach, based on the regulatory OPEX tool, facilitates comparisons between assessments conducted for regulatory purposes and aggregate assessments. Pyrethroids are chosen due to their proximity to concerning dietary exposure levels. This study's innovative approach aims to refine occupational exposure assessments, identify aggregate exposure risks, and enhance pesticide risk evaluation in occupational settings, contributing valuable insights for future studies.

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