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Integrated Environmental Assessment and Management

Session: Assessing Risks of Pesticides to Federally Listed (Threatened and Endangered) Species at a National Level

Abstract Title:
Deriving protection thresholds for threatened and endangered species potentially exposed to pesticides

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Abstract:
The Endangered Species Act requires specific and stringent protection to threatened and endangered species and their critical habitat. Therefore, protective methods for risk assessment for such species are needed. Species sensitivity distributions (SSDs) are a common tool used for setting safe limits on chemical exposure levels. Although the analysis and interpretation of SSDs varies widely, the basic methodology is quite general and can be summarized as a three-step procedure involving data compilation and evaluation, distribution fitting, and inference from the fitted distribution. These three steps can be accomplished in different ways with different results. We describe a methodology under development for setting conservative thresholds in risk assessment for threatened and endangered species exposed to pesticides. For estimating direct effects to threatened and endangered species, we use the 5% hazard concentration (HC_{05}) from the fitted SSD as the starting point for estimating exposure levels that would result in a 1 in a million probability of mortality, based on a probit dose-response curve. For indirect effects, e.g., effects on prey of threatened or endangered species, the threshold is set at 10% mortality. We also explore the importance of taxonomic diversity of species sampled for the SSD and implications for including all data in a fitted SSD when, for example, toxicity is known to vary with phylogeny, or with environmental conditions such as water hardness. We present the results of taxon-specific SSDs fit using one of four distributions (log-normal, log-logistic, log-triangular, and Burr) under several different fitting techniques (maximum likelihood, moment estimators, and order statistics)). We also evaluate the utility of model selection methods including Akaike's Information Criterion (AIC) and goodness-of-fit tests for ensuring the quality of resulting HC_{05} and threshold estimates.