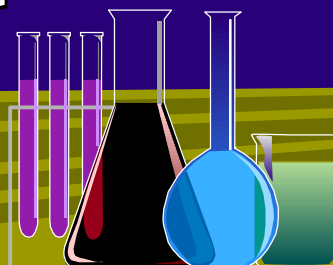


US EPA ARCHIVE DOCUMENT

Worker Risk Assessment



*Tolerance Reassessment
Advisory Committee Meeting
April 27, 1999*

Staff Paper #39

Overview

- *Introduction*
- *Worker Risk Assessment*
- *OP Issues To Date*
- *Pending Concerns*
- *Incident Data*
- *Issues For Consideration*



Introduction

- *Completed for all regulatory actions*
- *Governed by FIFRA, not FQPA*
- *Past OP actions based on high incident rates (e.g., ethyl parathion and mevinphos)*
- *Acute Worker Risk Strategy*



Worker Risk Assessment



Worker Risk Assessment

Overview:

- *Scope*
- *Factors We Consider:*
 - ◆ *Use Patterns*
 - ◆ *Types of Exposures*
 - ◆ *Hazard (Toxicity) Aspects*
 - ◆ *Chemical Properties*
 - ◆ *Job Function*
 - ◆ *Methods of Application*
- *Risk Assessment Approaches*
- *Chemical-Specific Exposure Data*
- *Pesticide Handlers Exposure Database*
- *Exposure Calculations*



Worker Risk Assessment (*con't*)

Scope: We consider uses in the following settings....



Agriculture



Industrial & Commercial
(e.g., fly control in food handling)



Public Places (e.g., turf management)



Worker Risk Assessment (con't)

Factors We Consider: *Use Patterns*

- *Label Information*
 - ◆ *what is allowable (e.g., max rates & freq.)*
 - ◆ *how it is applied (e.g., airblast to tree crops)*
 - ◆ *restrictions (e.g., spot treatment)*
- *Use & Usage Data*
 - ◆ *gives actual rates, frequencies, and activities*
 - ◆ *comes from multiple sources*
 - ◆ *determines type of risk assessments needed*



Worker Risk Assessment (con't)

Factors We Consider: *Types of Exposures*

- *1 to 7 days (short-term)**
 - *e.g., single early season application*
- *1 week to months (intermediate-term)**
 - *e.g., multiple applications*
- *Essentially every working day (long-term)*
 - *e.g., fungicide use in floriculture*

** most conventional pesticides*



Worker Risk Assessment (con't)

Factors We Consider: *Hazard (toxicity) Aspects*

Toxicity endpoint selection for risk assessment

- **Route:** *how a chemical enters the body*
 - ◆ *dermal (through the skin, predominant)*
 - ◆ *inhalation*
- *Animal studies used (usually oral administration requiring route-to-route extrapolation)*
- *Route-specific studies are preferred*



Worker Risk Assessment (con't)

Factors We Consider: *Chemical Properties*

■ **Basic Characteristics of the Chemical**

- ◆ *volatility*
- ◆ *water solubility*
- ◆ *sensitivity to light*
- ◆ *persistence of the chemical*
- ◆ *metabolism*

■ **Dislodgeable Residues: amount on leaf surfaces that can rub off onto the skin**

- *e.g., regional variability of a chemical on Florida and California citrus*



Worker Risk Assessment

Factors We Consider: *Job Function*

- *Handlers (mixer/loaders/applicators)*
 - ◆ *Growers & Custom Applicators*
 - ◆ *Pilots & Flaggers (guide aircraft from ground)*
 - ◆ *Pest Control Operators*
- *Post-application workers (in treated area)*
 - ◆ *Citrus & Bean Harvesters*
 - ◆ *Pruning Orchards*
 - ◆ *Tieing Tomatoes*



Worker Risk Assessment

Factors We Consider: *Methods of Application*

- *Pesticide Product (formulations)*
 - ◆ *dermal exposures for liquids & granulars*
 - ◆ *inhalation for granulars & wettable powders*
- *How Applied*
 - ◆ *groundboom & airblast*
 - ◆ *maximum vs. typical application rates*
- *Protective Measures Currently on Label*
 - ◆ *Personal Protective Equipment (PPE)*
 - *clothing, chemical resistant gloves, respirators*
 - ◆ *Engineering Controls*
 - *water soluble packets, closed loading systems, closed cabs*



Worker Risk Assessment (con't)

Risk Assessment Approaches

- *For Mixer/Loader/Applicators:*
 - ◆ *Chemical-specific exposure data*
 - ◆ *PHED (Pesticide Handlers Exposure Database)*
- *For Post-Application Exposures:*
 - ◆ *Chemical-specific exposure data*
 - ◆ *Standard factors from public and industry data*

Worker Risk Assessment (con't)

Chemical-Specific Exposure Data

- *Always preferable to have chemical- and scenario-specific data*
- *Have limited chemical-specific data*
- *Generally supports values from PHED when compared*

Worker Risk Assessment (con't)

Pesticide Handlers Exposure Database (PHED)

- Taskforce of EPA, Health Canada, California Department of Pesticide Regulation, European countries, and industry.
- Used since 1992 by over 20 countries.
- Premise is exposures are a.i. independent and related to how applied and how much applied.
- Library/database of actual exposure monitoring data for various application methods, formulations, and conditions (i.e., 66 different active ingredients and 100 studies).



Worker Risk Assessment (con't)

Liquid formulation
application via
groundboom

PHED (con't)

PHED

Airblast (shirt/pants)	Groundboom (shirt/pants)	Liquid Mixing/Loading (shirt/pants)
Airblast (coveralls & gloves)	Groundboom (coveralls & gloves)	Liquid Mixing/Loading (coveralls & gloves)
Airblast (closed cab)	Groundboom (closed cab)	Liquid Mixing/Loading (closed system)

Unit Exposure
(mg/lb ai)



Worker Risk Assessment (con't)

Other Factors

- *Standard values are used for some exposure factors*
 - ◆ *acres/day*
 - ◆ *body weight*
 - ◆ *duration*
 - ◆ *skin surface areas*
- *Standard references and data sources*
 - ◆ *Exposure Factors Handbook*
 - ◆ *Survey data*
 - ◆ *Equipment manuals*



Worker Risk Assessment (con't)

Exposure Calculations For Handlers

Daily Exposure (mg ai/kg/day) =

$$[Unit\ Exp(mg/lb\ ai) \times Acres/day \times Rate(lb\ ai/A)]/BW$$

Risk Calculations For Handlers

$$Margin\ of\ Exposure\ (MOE) = \frac{NOAEL\ (mg/kg/day)}{Exposure\ (mg/kg/day)}$$



Worker Risk Assessment (con't)

Post-Application Risk Assessment

- *Transfer coefficients (TCs)*
 - ◆ *TCs represent the level of contact with treated foliage while performing an activity*
 - ◆ *Chemical-specific and scenario-specific data are preferred*
- *1995 DCI - Agricultural Reentry Task Force*
 - ◆ *Scoping survey*
 - ◆ *Exposure data for extensive TC library*
 - ◆ *Product-specific dislodgeable data also required*



Worker Risk Assessment (con't)

Exposure Calculations For Post-Application Workers

Daily Exposure (mg ai/kg/day) =

$$[DFR (\mu\text{g}/\text{cm}^2) * (\text{mg}/1000\mu\text{g}) * TC (\text{cm}^2/\text{hr}) * 8\text{hr}]/BW (\text{kg})$$

Risk Calculations For Post-Application Workers

$$\text{Margin of Exposure (MOE)} = \frac{\text{NOAEL (mg/kg/day)}}{\text{Exposure (mg/kg/day)}}$$



OP Issues To Date

- *Many OP handler risk assessments show concerns.*
- *May be unable to mitigate some handler and post-application risks.*



Pending Concerns

- *Worker risk assessments are complex.*
- *Agricultural Reentry Task Force data are being developed.*
 - ◆ *DCI data due 2001*
- *FIFRA Risk/Benefit Balancing.*



Incident Data

- *Sources*
- *Previous actions based on high incident rates.*
- *Incident database is under-reporting, only worst events are likely.*



Incident Data (*con't*)

Sources of Incident Data

- *Incident Data System*
 - ◆ *6a2 allegations; seldom documented.*
- *Poison Control Centers.*
 - ◆ *no information on circumstances responsible.*
- *California Surveillance Program*
 - ◆ *best source; uniform data since 1982.*
- *NIOSH SENSOR States; Others*
 - ◆ *standardized data collection only since 1998.*
- *National Pesticide Telecommunications Network*
 - ◆ *allegations only; certainty criteria since 1997.*



Incident Data (con't)

Occupational Organophosphate Incidents Reported

- **PCC 1993-96:** 3205 exposures; 336 significant illnesses; 18 life-threatening; 1468 treated.
 - ◆ Highest % life-threatening of 18 types of pesticides, nearly twice the average for all pesticides.
 - ◆ OP's account for 23% of significant occupational illnesses due to all pesticides and 38% of life-threatening cases.
- **California 1991-95:** 387 illnesses; 296 systemic (probable and definite cases only)
 - ◆ Including possible cases there were 775 illnesses, 600 systemic.



Issues For Consideration

- *Increase baseline protective measures for all OPs (e.g., increased clothing and PPE).*
 - *Engineering controls for most toxic OPs (e.g., use of closed cabs).*
 - *Implement longer interim REIs until more refined analyses based on Agricultural Reentry Task Force data are possible.*
 - *Workshop to explain worker risk assessments.*
- 