A systematic review of exposure assessment methods in studies of occupational pesticide exposure 1993-2017

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Background

• Assessment of occupational pesticide exposure is methodologically challenging:
  – Variance by climate, application method, personal protection equipment, number of pesticides applied etc.
  ➔ large exposure variability between workers, body parts, and over time

• Numerous exposure assessment methods (EAM) developed: e.g. biomonitoring, self-report of exposure, job-exposure matrices (JEM)

• Different EAM generate different study results\(^1\) (misclassification)

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Objective

• To systematically review EAM used in epidemiological studies of occupational exposure to pesticide published the last 25 years
• This review combined with future studies assessing the validity of EAM (as in IMPRESS*) may inform on the magnitude of exposure misclassification

*IMPRESS (Improving exposure assessment methodologies for epidemiological studies on pesticides)
Methods: searches

• Medline and Embase (subject headings and keywords):

  pesticide AND (occupational exposure OR dermal exposure OR inhalation exposure OR dietary exposure OR paternal exposure OR maternal exposure OR environmental monitoring)

• Original research published 1.1.1993-31.12.2017

• Languages: English, Dutch, Spanish, French, German and Scandinavian languages
Methods: study eligibility

• Included
  – Studies analyzing associations of occupational pesticide exposure and any health outcome
• Excluded
  – reviews
  – methodology studies
  – case reports
  – descriptive studies without health endpoints
Results: screening

1. Medline and Embase (n=8945)
   - n=222 duplicates

2. Titles screened (n=8723)
   - n=4506 off topic titles
   - n=241 reviews

3. Abstracts screened (n=3976)
   - n=776 reviews
   - n=243 methodology
   - n=689 no outcome
   - n=343 incorrect population
   - n=364 incorrect exposure

4. Eligible for data extraction (n=1561)
   - n=247 data extraction not possible

5. Completed data extraction (n=1314)
Results: data extraction and analysis

• Extracted from 1314 relevant studies:
  – EAM
  – Health outcome
  – Study type
  – Publication year

• 176 articles with >1 EAM ➔ in total n=1497 EAM applied

• Analysis of relative frequencies of EAM in relation to the total number of EAM appliances throughout all studies
Results: EAM frequencies (total)
Results: trends direct/indirect EAM

No time trend of studies with >1 EAM
Results: trends in indirect EAM
Results: trends in direct EAM
Results: EAM by study type

Proportion of EAM appliances (%)
Results: EAM by outcome type
Discussion/Conclusion

• Limitations
  - One reviewer (eligibility double checked during extraction phase)
  - EAM in 19% of studies could not be extracted (no full text access)
  - Potentially non-detected EAM in full text
    (extraction mainly based on abstract 80-90%)
Discussion/Conclusion

• Majority of applied EAM were indirect - no trend over time
• Indirect methods frequently applied in cancer studies – potential for responder bias and differential exposure misclassification
• Increase in use of self-reported exposure
• Increase in application of JEM - might partly explain reduction in expert case-by-case assessments
• Decrease in use of job titles/register information
• Relative infrequent use of algorithms and models with slight decrease over time
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