

# ARE PESTICIDES RELATED TO PARKINSON'S DISEASE? SOME CLUES TO HETEROGENEITY IN STUDY RESULTS

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**Background and Aims:** Previous systematic reviews have indicated that pesticide exposure is possibly associated with Parkinson's disease. However, large heterogeneity has been observed in study results. We aimed at providing an update of the literature published on Parkinson's disease and exposure to pesticides, by performing a systematic review and meta-analysis. In addition, we investigated if methodological differences between studies could explain the heterogeneity in study results.

**Methods:** Studies were identified through a systematic literature search. Summary risk ratios (sRR) for pesticide exposure and subcategories were calculated using random effects meta-analyses. Potential sources of heterogeneity were investigated by meta-regression and stratified analyses.

**Results:** Thirty-eight case-control studies, 4 cohort studies and 3 cross-sectional studies were identified. An sRR of 1.65 (1.42-1.92) for pesticide exposure (ever vs. never) was found. This association was also observed for exposure to herbicides and insecticides but not for fungicides. Heterogeneity in individual study results was not related to study design, source of control population, adjustment of results for potential confounders or geographical area of the study. However, heterogeneity was possibly related to differences in the exposure assessment. Pesticide exposure assignment based on job-titles resulted in a higher sRR than studies relying on self-reported exposure with sRR of 2.5 and 1.5, respectively.

**Conclusions:** This review strengthens the evidence that exposure to herbicides and insecticides can increase the risk of Parkinson's disease. A suggestive effect for method of exposure assessment was found. Future studies should therefore focus on more objective and improved methods of exposure assessment.