

# The association between ambient exposure to organophosphates and Parkinson's disease risk

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## Abstract

**Objectives** There is a general consensus that pesticides are involved in the aetiology of Parkinson's disease (PD), although associations between specific pesticides and the risk of developing PD have not been well studied. This study examines the risk of developing PD associated with specific organophosphate (OP) pesticides and their mechanisms of toxicity.

**Methods** This case–control study uses a geographic information system-based exposure assessment tool to estimate ambient exposure to 36 commonly used OPs from 1974 to 1999. All selected OPs were analysed individually and also in groups formed according to their presumed mechanisms of toxicity.

**Results** The study included 357 incident PD cases and 752 population controls living in the Central Valley of California. Ambient exposure to each OP evaluated separately increased the risk of developing PD. However, most participants were exposed to combinations of OPs rather than a single pesticide. Risk estimates for OPs grouped according to different presumed functionalities and toxicities were similar and did not allow us to distinguish between them. However, we observed exposure-response patterns with exposure to an increasing number of OPs.

**Conclusions** This study adds strong evidence that OPs are implicated in the aetiology of idiopathic PD. However, studies of OPs at low doses reflective of real-world ambient exposure are needed to determine the mechanisms of neurotoxicity.

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