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Mosquito Control Workers in Malaysia: Is Lifetime Occupational Pesticide Exposure Associated With Poorer Neurobehavioral Performance?

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Abstract

Background: Use of pesticides has been linked to neurobehavioral deficits among exposed workers. In Malaysia, organophosphate and pyrethroid pesticides are commonly used to control mosquito-borne diseases. Objectives: This study aims to assess workers' lifetime occupational pesticide exposure and examine the relationship with neurobehavioral health. Methods: A cross-sectional study was conducted on 158 pesticide-exposed and 176 non-exposed workers. To collect historical exposure and job tasks, a questionnaire and an occupational history interview were used. Pesticide exposure was measured in a subgroup of workers via inhalation and skin contact. The total pesticide intake of each worker was assessed using inhalation and dermal exposure models. CANTAB® computerised neurobehavioral performance assessments were used. Results: The participants' mean age was 31 (8) years. Pirimiphos-methyl (median = 0.569 mg/m³, Interquartile range [IQR] = 0.151, 0.574) and permethrin (median = 0.136 mg/m³, IQR = 0.116, 0.157) had the highest measured personal inhalation concentrations during thermal spraying. The estimated total lifetime pesticide intake for exposed workers ranged from 0.006 g to 12800 g (median = 379 g and IQR = 131, 794 g). Dermal exposure was the predominant route of pesticide intake for all workers. Compared to controls, workers with high lifetime pesticide intake had lower Match to Sample Visual (adjusted B = -1.4, 95% Confidence Interval (CI) = -2.6, 0.1), Spatial Recognition Memory (adjusted B = -3.3, 95% CI = -5.8, 0.8), Spatial Span (SSP) (adjusted B = -0.6, 95% CI = -0.9, 0.3) scores. Workers with low pesticide intake performed worse than controls (adjusted B = -0.5, 95% CI = -0.8, -0.2) in the SSP test, but scored higher in the Motor Screening test (adjusted B = 0.9, 95% CI = 0.1, 1.6). Higher Paired Associates Learning test scores were observed among higher (adjusted B = 7.4, 95% CI = 2.3, 12.4) and lower (adjusted B = 8.1, 95% CI = 3, 13.2) pesticide intake groups. There was no significant difference between the Reaction Time and Pattern Recognition Memory tests with lifetime pesticide intake after adjusting for confounders. Conclusion: Pesticide exposure has been linked to poorer neurobehavioral performance. As dermal exposure accounts for a major fraction of total intake, pesticide prevention should focus on limiting dermal exposure. © 2022 The Author(s). Published by Oxford University Press on behalf of the British Occupational Hygiene Society.

Author Keywords

dermal; exposure; inhalation; lifetime; neurobehavioral; organophosphate; pesticide; pyrethroid; worker

Index Keywords

Diagnosis, Mosquito control, Pesticides; Confidence interval, Dermal, Exposure, Inhalation, Lifetime, Neurobehavioural, Organophosphate, Pesticides exposures, Pyrethroids, Workers'; Disease control; organophosphate, permethrin, pesticide, pyrethroid; adult, cross-sectional study, human, Malaysia, mosquito control, occupational exposure; Adult, Cross-Sectional Studies, Humans, Malaysia, Mosquito Control, Occupational Exposure, Organophosphates, Permethrin, Pesticides, Pyrethrins

Chemicals/CAS

permethrin, 51877-74-8, 52645-53-1; Organophosphates; Permethrin; Pesticides; Pyrethrins

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