

Family Occupational Pesticide Exposure in the Fresh-cut Flower Industry and Acetylcholinesterase (AChE) in Children

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INTRODUCTION

- Children of agricultural workers are at increased risk of pesticide exposure from pesticide take-home pathways
- Organophosphates and carbamates are commonly used agricultural pesticides that inhibit AChE, an enzyme that regulates acetylcholine concentration and is used as a marker of cholinesterase inhibitor exposure.
- It is unclear whether secondary pesticide exposure is sufficient to inhibit AChE among children

HYPOTHESIS

- Cohabitation with a flower plantation worker introduces sufficient cholinesterase inhibitor pesticides to suppress AChE concentrations in children

METHODS

- Participants:** Effects of Secondary Pesticide Exposures in Infants, Children and Adolescents (ESPINA) study.
 - 313 mestizo and indigenous boys and girls, 4-10 years of age in 2008. Most were identified from participation in the Survey of Access and Demand of Health Services in Pedro Moncayo County in 2004
 - 55% cohabited with ≥ 1 flower plantation worker, mean duration of cohabitation= 5.2 y
 - Location:** Pedro Moncayo County, Pichincha, Ecuador, an area with year-round floricultural activity
- Measurements:**
 - Erythrocyte AChE and hemoglobin concentrations (EQM Testmate system: finger-stick blood sample)
- Analysis:**
 - Multiple linear regression and multiple logistic regression
 - Concurrent flower worker cohabitation (dichotomous) and length of cohabitation (continuous and categorical) were analyzed
 - AChE concentrations were analyzed continuously and categorically.

RESULTS

Table 1. Adjusted* mean AChE concentration by cohabitation status

Cohabitation With	AChE Mean U/ml	P-Value
Flower plantation worker	3.09	0.039
Non-agricultural worker	3.19	

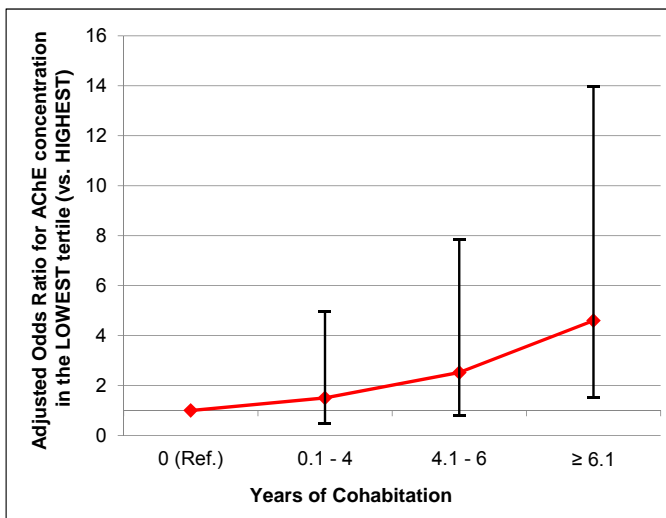
Table 2. Adjusted* odds ratios (OR) of AChE concentration by flower worker (FW) cohabitation and duration of cohabitation

Independent	Dependent	OR	95% CI
FW Cohabitation	Low ¹ AChE	2.92	1.12 - 7.63
Cohabitation Duration (per yr)	Low ¹ AChE	1.15	0.98 - 1.35
	AChE Tertiles²		
	3 rd (Ref.)	1	
FW Cohabitation	2 nd	1.78	0.82 - 3.82
FW Cohabitation	1 st	2.82	1.22 - 6.54
Cohabitation Duration (per yr)	2 nd	1.07	0.94 - 1.22
Cohabitation Duration (per yr)	1 st	1.23	1.07 - 1.41

* Adjusted for: gender, age, z-score height for age, hemoglobin concentration, parish of residence, income, pesticide use within household lot, pesticide use by contiguous neighbors.

¹AChE ≤ 2.63 U/ml ≈ 1.2 SD below non-cohabitant mean

²AChE tertiles: 1: <2.94 U/ml, 2nd: 2.94-3.32 U/ml, 3rd: >3.32 U/ml



Cohabitation with flower workers inversely associated with AChE

- Cohabitation with a flower worker was associated with a mean AChE decrease of 0.1 U/ml
 - AChE overall mean: 3.14 U/ml, SD: 0.49
- Compared to non-agricultural worker cohabitation, flower worker cohabitation was associated with 2.8 times the odds of low AChE

Duration of cohabitation inversely associated with AChE

- Every year of cohabitation was associated with:
 - An AChE DECREASE of 0.02 U/ml ($p=0.04$)
 - 1.2 times the odds of AChE in lowest tertile
- Cohabitation ≥ 6 years was associated with 4.3 times the odds that AChE was in its lowest tertile

CONCLUSION

- Cohabitation with a flower worker exposed children to enough pesticide to suppress AChE activity.
- Greater AChE suppression was associated with longer cohabitation which may be explained by:
 - pesticide accumulation within households
 - decreased practice of take-home reduction methods with longer work experience

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