

OPERATIONAL AND SCIENTIFIC NOTES

CHOLINESTERASE DEPRESSION IN CALIFORNIA MUNICIPAL AND MOSQUITO ABATEMENT DISTRICT PESTICIDE APPLICATORS

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Recent changes in the California Department of Food and Agriculture's Worker Health and Safety regulations¹ expand jurisdiction beyond agricultural pesticide applicators to include all pesticide applicators; however, only agricultural applicators will be required to have medical supervision including cholinesterase testing. A literature exists on cholinesterase depression among agricultural pesticide applicators which can be used to guide the development of regulations regarding safe pesticide application, but little has been documented concerning municipal and mosquito abatement district pesticide applicators. This relative lack of information makes it difficult to answer such basic questions as the extent of worker's cholinesterase depression related to organophosphate and carbamate pesticide exposures, or their need for medical supervision (i.e., cholinesterase monitoring), or the need for other regulations governing these workers.

This paper addresses some of these questions by examining cholinesterase depression among California municipal and mosquito abatement district workers during 1985. These workers are not currently covered under State medical supervision regulations. However, many state agencies place their employees under medical supervision following the guidelines issued for agricultural applicators. Additionally, employees of local governmental agencies who use pesticides to control mosquitoes and other vectors are certified by the California Department of Health Services. There are approximately 1,000 certified mosquito control technicians statewide.

In 1985 the California Department of Food and Agriculture issued a "data-call-in" for the cholinesterase test result records for all pesticide applicators under medical supervision. Under the Worker Health and Safety regulations current at that time, these workers included agricultural pesticide applicators (mixers, loaders, pilots and flaggers) handling (or expected to

handle) Toxicity Category I or II² organophosphate or carbamate pesticides for 30 or more hours in any 30 day period³. The request for worker records was directed to the employers who redirected the request to the medical supervisors, who frequently redirected the request to the clinical laboratories which performed the chemical analysis on the blood samples collected from the workers and also maintained records of the results. The consequence of this indirect process of data collection was that the clinical laboratories submitted all records for workers under medical supervision in the State, regardless of the reason they were under medical supervision. The call-in data were released to the Department of Health Services for analysis. Included in these data were the 73 municipal and 65 mosquito abatement district workers described in this report. The degree to which this sample represents the California universe of municipal and mosquito abatement district workers is unknown and this limits the degree of generalization of the results. Data for the California agricultural pesticide applicators are presented separately (Ames et al. 1988).

Cholinesterase monitoring, as specified in the Department of Health "Guidelines for Physicians" (Department of Health 1974), specifies: (1) the development of individual plasma and red blood cell (RBC) baselines taken at least 30 days prior to exposure to cholinesterase-inhibiting pesticides; and (2) routine cholinesterase testing to be performed when exposure to Toxicity Category I and II organophosphate and carbamate pesticides, not exclusively using closed mixing and loading systems, exceeds 30 hours in any 30 day period.

² These toxicity categories are established by the U.S. Environmental Protection Agency (EPA) based upon laboratory test animals establishing oral and dermal median lethal doses (LD50's), and eye and skin effects. Toxicity Category I pesticides, the most toxic, include pesticides with oral LD50's up to and including 50 mg/kg, while Toxicity Category II pesticides have oral LD50's of between 50 and 500 mg/kg.

³ California Administrative Code, Title 3, Chapter 6, Section 6728.

¹ State of California Administrative Code, Title 3, Chapter 6.

California certifies laboratories to perform cholinesterase testing using a variety of different, and non-comparable, procedures including the Ellman, delta pH, Michele, and micro-Michele methods; therefore, all tests for any individual should be performed by the same laboratory using the same method, and this is recommended in the "Guidelines."

California medical supervision "Guidelines" call for removal of the worker from exposure when cholinesterase activity is depressed below 50% of the worker's plasma baseline, or when cholinesterase activity is depressed below 60% of the RBC baseline. Workers removed from exposure due to low cholinesterase values are prohibited from reexposure to cholinesterase-inhibiting pesticides until their cholinesterase activity values return to within 20% of baseline values. Based upon the analysis performed on the agricultural applicators (Ames et al. 1988), the Department of Health Services has proposed that the thresholds be made more conservative, specifically that the thresholds be set at depression below 60% of baseline for plasma and below 70% of baseline for RBC values. These proposed standards for agricultural pesticide applicators are currently in the process of public hearings, as required before adoption.

All mid-season, or exposure period, cholinesterase activity results for medical supervision are analyzed in terms of "percent-of-baseline." Two threshold criteria are employed in this analysis: (1) cholinesterase depression below the worker's baseline exceeding the *current* Worker Health and Safety regulations for agricultural applicators; and, (2) cholinesterase depression

below the worker's baseline exceeding the *proposed* Worker Health and Safety regulations for agricultural applicators.

Overall, none of the municipal or mosquito abatement district pesticide applicators would have been removed from exposure to cholinesterase-inhibiting compounds by the existing threshold criteria established for agricultural pesticide applicators, Table 1. By contrast, 4.8% of the agricultural pesticide applicators had experienced a similar level of cholinesterase depression during the same time period (Ames et al. 1988). If the proposed medical supervision regulations were to be extended to include municipal and mosquito abatement district pesticide applicators, three workers, 2.2% of the sample, would have been removed from exposure (1.5% of mosquito abatement district workers and 2.7% of municipal employees). One of these three workers was a tree maintenance worker with recent prior handling of Bidren (dicrotophos), a Category I carbamate. Another was a mosquito abatement district pilot, with recent handling of six organophosphate and carbamate pesticides using a closed loading system. Pesticides handled by this worker in the prior two weeks included parathion spray 8, Baytex 2% granules (fenthion), M.A.D. special (fenthion), Dursban 4E (chlorpyrifos), Malathion 8, and Baygon 70% wetable powder (propoxur). The final worker was a park maintenance worker. None of these workers were reported to have pesticide-related illness during the data collection time-period.

Municipal employees and Mosquito Abatement District workers may handle pesticides

Table 1. Cholinesterase depressions of municipal and Mosquito Abatement District pesticide applicators below current and proposed California thresholds established for agricultural applicators.

Agency	No. of workers surveyed	Workers with ChE below thresholds	
		Below current thresholds ¹	Below proposed thresholds ²
Municipal Agencies			
Sacramento City—Golf	22	0	0
Sacramento City—Parks	7	0	1
Sacramento City—Tree	24	0	1
Sacramento Co—Parks & Rec	16	0	0
Other Municipal Workers	4	0	0
Total—all Municipal	73	0	2 (2.7%)
Mosquito Abatement Districts			
Sacramento-Yolo M.A.D.	27	0	0
San Joaquin M.A.D.	31	0	1
Sutter-Yuba M.A.D.	7	0	0
Total—all M.A.D.	65	0	1 (1.5%)
Total—all workers	138	0	3 (2.2%)

¹ Current California medical supervision threshold values are depression below 50% of plasma base line or below 60% of RBC base line.

² Proposed California medical supervision threshold values are depressions below 60% of plasma base line or below 70% of RBC base line.

that are less toxic or in greater dilution than those handled by agricultural applicators. Many accidental exposures, however, occur during the dilution process.

Even given this relatively small sample of municipal and mosquito abatement district workers, whose degree of representativeness of the California universe of municipal and mosquito abatement district workers is unknown, the findings of an estimated 2% of workers falling below the more conservative cholinesterase activity thresholds proposed for agricultural applicators, with none exceeding current thresholds, and lacking any reports of pesticide-related illness among these workers, it would not appear that extending Worker Health and Safety reg-

ulations to include these nonagricultural workers is warranted. It should be noted that many municipal agencies and mosquito districts require medical supervision of their pesticide applicators even in the absence of State or other external regulations.

REFERENCES CITED

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