

Pesticide Research and Identification Project

Workplan

Summary

The Pesticide Research and Identification Project will provide a list of pesticides most likely to replace diazinon and chlorpyrifos in the urban marketplace and assess their risks to surface water quality. Key project objectives are:

- To identify those replacement pesticides likely to gain significant market share;
- To estimate the potential for these pesticides to adversely affect water quality; and
- To recommend future strategies to protect water quality.

The information developed from this project will help Regional Water Quality Control Boards and other government agencies focus on potential future sources of pesticide-related urban surface water toxicity.

The Project is funded by California Regional Water Quality Control Board, San Francisco Bay Region (Regional Board) and being conducted by the San Francisco Estuary Project (SFEP). SFEP has retained TDC Environmental, LLC as its technical consultant for the project. The project manager is Kelly D. Moran, Ph.D., TDC Environmental.

Project Tasks

1. Prepare workplan. Submit this detailed work plan for the technical work described below that identifies data sources, analysis techniques, potential data gaps, schedule considerations, and other pertinent information.
2. Form Peer Review Committee. Establish a two or three member peer review committee to review preliminary findings and draft deliverables. The Urban Pesticides Committee (UPC) will also be updated on the project and its members will be provided with the opportunity to review drafts of written products.
3. Create list of major alternatives to diazinon and chlorpyrifos. Review available data regarding trends in pesticide sales and use and identify up to ten pesticides that could replace diazinon and chlorpyrifos in the urban marketplace and that are likely to gain significant market share.
4. Evaluate major alternatives for potential to affect surface water quality adversely. Estimate the potential for these pesticides to adversely affect water quality using available data on their chemical and environmental properties, ambient water quality, and their likely use patterns.
5. Identify data gaps and information needs. Identify data gaps and information needs to improve estimates and recommend studies to fill data gaps.
6. Prepare recommendations to prevent water quality problems. Suggest actions that could be taken to prevent the identified pesticides from posing future water quality problems.

7. Prepare monthly reports. Provide brief monthly progress reports to SFEP/ABAG and meet with SFEP/ABAG when necessary to facilitate task execution.
8. Prepare final report. Provide a final report in hard copy and reproducible electronic form. Provide a draft to SFEP/ABAG and to the project Peer Review Committee for review.
9. Provide regulatory updates. (*Contingency task to be conducted as funds allow*). Monitor USEPA (primary) and DPR (secondary) pesticide regulatory activities relevant to pesticides of surface water quality interest. Provide electronic summaries suitable for distribution to others (e.g., the Urban Pesticides Committee) and—at the request of the Regional Board—draft comment letters.

Data Sources

For this project, TDC Environmental anticipates using the following data sources. For usage trend information:

- Pesticide use data reported to the State of California
- Pesticide product sales, use, and store shelf surveys conducted by others (the UC IPM Southern California survey is the most complete of these sources)
- Information from pesticide manufacturer and distributors (to be obtained primarily from Internet sites, promotional literature, and consultant Annie Joseph's work)
- Notices issued by DPR listing pesticides entering registration process and pesticides registered
- Statewide pesticide sales figures (to the extent available from DPR)
- DPR Product/Label database
- Pesticide product labels
- Information from USEPA, OPP, BEAD on urban sales of alternatives (if it has obtained such information and can share it)

For water quality, pesticide chemical property, environmental fate and transport, and toxicity information:

- Data reported from the USGS National Water Quality Assessment (NAWQA; this is the most complete available urban surface water data set)
- DPR's surface water database
- Papers published in relevant journals like *Environmental Science & Technology* and *Environmental Toxicology & Chemistry*
- Pesticide Action Network Pesticide Database (<http://www.pesticideinfo.org>; has compilation of literature data on pesticide properties and toxicity)
- National Library of Medicine's Toxnet Hazardous Substances Data Bank (HSDB) (<http://toxnet.nlm.nih.gov/>)
- National Pesticide Telecommunications Network and USEPA pesticide fact sheets

- The Extension Toxicology Network (EXTOXNET; <http://ace.orst.edu/info/extoxnet/>)
- USEPA risk assessments and related technical reports
- USEPA responses to Freedom of Information Act requests for disclosure of pesticide inert ingredients
- DPR Product/Label database (formulation information)
- Technical reports from credible sources

Analysis Techniques

A. Creating the list of major alternatives to diazinon and chlorpyrifos

Usage trend indicators (see data sources, above) will be explored for insecticides that control the same target pests on the formerly common urban sites of use for diazinon and chlorpyrifos. The insecticides that are most likely to be identified are:

- Pyrethroids—likely candidates include pyrethrins, pyrethrum, deltamethrin, cypermethrin, tetramethrin, sumithrin, permethrin, allethrin, bifenthrin, esfenvalerate, and resmethrin.
- Carbamates—the most likely substitute is carbaryl (Sevin); other carbamates, such as propoxur and bendiocarb.
- Other organophosphate pesticides—the most likely substitute is malathion.
- Other pesticides—imidachloprid is a new insecticide with increasing market share.
- Synergists—piperonyl butoxide is included as a synergist in most pyrethroid products.

Limited data on surface water detections (primarily relying on NAWQA data) and toxicity (primarily relying on information in the Pesticide Action Network Pesticide Database and Toxnet HSDB) will be collected and summarized for up to 20 pesticides that are candidates for the list. This limited data will be used for screening; a more thorough review will be conducted for selected pesticides.

Selection of the priority insecticides (up to 10) will involve cross referencing the lists of anticipated high use substitutes for diazinon and chlorpyrifos with the screening surface water quality data and basic toxicity information, in an attempt to avoid omitting potentially environmentally important pesticides (e.g., those highly toxic pesticides that have previously been detected in urban surface waters). If the candidate list is too long, the list will be trimmed further based on one or more of the following additional criteria:

- i. The potential for release to surface water from common sites of use for the pesticide (using methods from *Diazinon and Chlorpyrifos: Screening for Water Quality Implications*)—those with common sites of use with greater potential for runoff (e.g., impervious surfaces) will be prioritized over those with most sites of use with lower potential for runoff (e.g., landscaping).

- ii. The frequency of appearance of the pesticide in retail products as determined by informal visits to major pesticide retailers (to determine regional applicability of available usage trend data).
- iii. The chemical similarity among pesticides on the candidate list.

A brief memorandum detailing the information above and the selected list of pesticides will be prepared, reviewed with the Peer Review Committee and the UPC, and finalized based on reviewer input.

B. Evaluating major alternatives for potential to affect surface water quality adversely

TDC Environmental will estimate the potential for these pesticides to adversely affect water quality using available data on their chemical and environmental properties, ambient water quality, and their likely use patterns. The following steps will be used to conduct this analysis.

- (1) Summarize chemical and environmental properties of each selected pesticide, based on information from the literature. This background information will include chemical formula and structure, solubility, chemical analysis methods, field half life, application site runoff fraction and other environmental fate data (if available from literature), mode of action, and aquatic toxicity. Pesticides with similar modes of action (and therefore likely cumulative human or aquatic toxicity) will be noted.
- (2) Describe registered products. For each selected pesticide, summarize the number of products registered, formulation types, available sites of use. Identify urban sites of use (categories) with potential water quality impacts. Obtain (from USEPA), summarize, and interpret (using methods from *Diazinon and Chlorpyrifos: Screening for Water Quality Implications*) available information about inert ingredients that appear in products containing each selected pesticide.
- (3) Identify the regulatory status of each selected pesticide. The status of each pesticide in USEPA's pesticide registration review process will be determined. Other regulatory reviews currently underway will be identified. Inclusion of the pesticide on regulatory lists (e.g., California Proposition 65) that may affect future use will be noted. Water quality standards, guidelines, and comparison values developed by government agencies or respected scientific bodies will be identified.
- (4) Summarize available water quality data. Data from USGS's NAWQA and other literature (see above) will be summarized and compared to available water quality standards. Any information linking the presence of one or more of the selected pesticides in surface water to toxicity will be highlighted.

- (5) Evaluate information. Use weight of evidence approach to estimate potential for each selected pesticide to impact surface waters. Provide the confidence level of the estimate. To the extent possible, rank or compare estimates so as to indicate priorities for future activities. Techniques for prioritization may include estimates of usage needed to cause toxicity in surface water in a model watershed (employing methodology similar to that used in *Diazinon in Urban Areas*).

A brief memorandum detailing the information above and the selected list of pesticides will be prepared, reviewed with the Peer Review Committee and the UPC, and finalized based on reviewer input.

C. Identifying Data Gaps, Information Needs, and Recommendations

TDC Environmental will identify data gaps, information needs, and potential recommendations throughout the course of the project. These will be summarized and included in the draft report. If the project team so desires, preliminary versions of these items can be provided in a separate short memorandum to be circulated for review by the UPC.

Potential Data Gaps

Lack of data in certain areas is anticipated to be a significant issue for this project. There are three major areas of potential data gaps:

- Sales data. Available pesticide sales data are very limited. Further, the project involves an unavoidable element of prediction of future consumer and professional pesticide applicator choices, an inherently uncertain task.
- Water quality data. Few of the common alternatives to diazinon and chlorpyrifos have been monitored in surface waters and none have been monitored routinely in urban watersheds. The most important problem is the lack of standard methods with environmentally relevant detection limits for pyrethroids. This means that little data are available for this important class of alternatives. Although toxicity testing could be a helpful data source, toxicity testing including toxicity identification evaluation (TIE) procedures capable of identifying toxicity from alternatives to diazinon and chlorpyrifos is rare.
- Pesticide characterization data. Many new pesticides have not been fully characterized in urban environmental situations. For example, few pesticides have been tested to determine the fraction of pesticide applied to an urban site (e.g., an impervious surface) that is released in subsequent storm runoff; this is a major factor in determining the potential risks for water quality.

To deal with data gaps, the project will use a weight of evidence approach in its analyses. The report will include a section specifically identifying data gaps and noting which gaps are the highest priority for future research.

Project Schedule

Item	Date
Draft project work plan	Early January
Final project work plan	Two weeks subsequent to receipt of comments on draft
Monthly progress reports	Monthly, no later than upon submittal of the monthly project invoice
Project updates and peer discussion/review of draft written products	Bimonthly, at Urban Pesticides Committee meetings (anticipated in January, March, May, July, September, and November)
Research and develop draft list of major alternatives to diazinon and chlorpyrifos (including rationale)	December-February
Discuss draft list with UPC; list review by peer review committee	Early to mid March
Finalize list of major alternatives	Early April
Evaluate major alternatives for potential to affect surface water adversely	March-November
Provide written reports of project findings (may be in format of draft report sections) to peer review committee and UPC	Approximately bi-monthly (intend to coordinate to UPC meetings)
Possible Peer Review Committee meeting to review draft report sections and to discuss ideas regarding data gaps, information needs, and recommendations	June, July or August
Identify data gaps and information needs	January-November
Develop recommendations regarding data gaps, information needs, and water quality protection	January-November
Draft report	October-November; deliver on or before November 15, 2002
Peer review committee meeting to review draft report	Late November or early December
Final Report	Deliver on or before December 31, 2002