



Using Biomonitoring and Air Monitoring in a Study at Tulare County to Implement a New California Public Health Law on Exposure to Environmental Toxicants

Margaret Reeves

Pesticide Action Network North America (PANNA)

Funding Amount \$200,000

INTRODUCTION

Biomonitoring is the testing of human biospecimens, such as blood, urine, breast milk or fatty tissue, for the presence of toxic chemicals. By using biomonitoring and combining it with air monitoring, we can demonstrate the source of exposure and identify clear targets for where exposure should be reduced. In this study, Tulare County residents monitored the air at homes situated near orange groves where the pesticide chlorpyrifos had been used. In addition to the air samples, urine samples from 34 participants were analyzed for chlorpyrifos metabolite. The California Environmental Contaminants Biomonitoring Program—the first of its kind in the United States—will be implemented based on the results of this study. Unlike most biomonitoring studies reporting only summary data, this project (and the state's program) offers individuals their test results. Project evaluation will analyze the effectiveness of results communication and community organizing in engaging residents in advocating for better health protections.

POLICY/PRACTICE IMPLICATIONS

Because biomonitoring demonstrates the ultimate evidence of personal toxic chemical pollution, it is a powerful tool for developing public support for policies that protect human and ecosystem health. Toxics-affected communities, nongovernmental organizations and public health agencies around the country are increasingly eager to use this tool to trigger policy change. Unfortunately, a common protocol for conducting such studies and using the results to support policy change does not yet exist. We hope this study will provide a useful model. Furthermore, we expect that by combining air monitoring with biomonitoring, we can enhance the tool by providing the ultimate

demonstration of the source of exposure and hence identify clear targets for reducing levels of exposures that cause concern.

The [California Environmental Contaminant Biomonitoring Program \(CECBP\)](#) was passed in 2006 as the result of widespread grassroots organization and collaboration from the California Department of Public Health. Project partner Commonwealth Biomonitoring Resource Center and other nonprofit and community-based organizations were determined to establish a state-run program, with real community participation, to monitor communities for the presence of toxic chemicals in community residents' bodies. The organizations were also determined to create public health policies to decrease those exposures and the adverse health effects associated with those exposures. Since 2008, community members around the state have participated in a number of workshops to identify key target chemicals for biomonitoring. Pesticides are ubiquitous in the air, soil and water in many parts of the state including the vast agricultural Central Valley—location of some of the highest rates of asthma among children. Central Valley is also the location of the majority of the reports of worker and bystander poisonings by pesticides, many of which are associated with chronic illnesses such as learning deficits, respiratory problems, cancers, Parkinson's disease, and reproductive and developmental problems, among others. For these reasons and for the reason that the insecticide chlorpyrifos was banned in 2000 for residential use, largely because of its hazards for children (yet is still used widely in agriculture), it was selected as the target chemical for this project as one of CECBP's initial efforts.

RESULTS

Air monitoring and biomonitoring

During the summer (pesticide spray season) of 2008 we conducted air monitoring in the area of the Central Valley where walnuts were grown. The expectation was to add the biomonitoring component in the second year. While the target pesticide was detected, levels were not as high as expected (only 3 of 28 samples were above 25 ng/m³) and not nearly as high as those detected in a similar air-monitoring project from 2004 to 2006. In the 2004-06 project, then 33 of the 116 air samples taken over a 21-day period were above EPA's reference level of 170 ng/m³ for short-term (acute and sub-chronic) exposure for children. The highest recorded levels were 1902 and 1017 ng/m³ on two consecutive days.

New pesticide use data on application rates, not previously available, was used to study neighboring areas in the Tulare County where oranges were grown. In early July 2009 we conducted both air monitoring and biomonitoring for the same target pesticide. Again, only 3 of 28 samples were above 25 ng/m³, levels substantially below the 2004-06 levels. We made the third and final methods modification to be implemented during a project extension period in June/July 2010. The principal modification is that the precise

sampling dates for both air and urine will be determined by project participants in response to their actual on-the-ground experience—seeing, hearing, or, preferably, smelling pesticide applications.

Communication of results

The development of effective protocols for communicating results to individual biomonitoring participants and to their communities will be essential for the operation of the CECBP. The Tulare monitoring project partners are working to develop materials to ensure that information about results will be well understood by the community and that the community will be prepared to use the results to support change, should the results indicate higher than acceptable levels of exposure. The project partners include community members and representatives from state agencies and the organizing nongovernmental organizations. (See [Key People](#) list.)

Project partners have conducted one focus group from the community to assess reasons for participation in the project and to evaluate the basic information level about biomonitoring and about the pesticide for which they are being tested. The focus group format was designed to answer the following questions:

- Why do participants want to be involved in biomonitoring studies?
- What do study participants want to know about contaminants?
- What concerns and needs do study participants have in response to learning about contaminants in their bodies?
- How do biomonitoring results affect the lives and behaviors of participants?
- How much and what type of written information is appropriate?
- What visual tools best aid in the understanding of personal results?

Preliminary results indicated that 1) community members wanted oral explanations of written materials concerning results, and 2) community members believe the project will connect pesticide exposures to a variety of diseases from which they are suffering. As a consequence, the team will be developing materials to explain the project more fully since it is unlikely the project results can be linked to individual health outcomes. In addition, project partners will develop materials to help Tulare County health providers explain data results to project participants. Project partners will also communicate the need for providers to address participants' health concerns.

The project partners will conduct a second round of focus groups in early spring 2010 that will incorporate what was learned from the first focus group as well as new research about chlorpyrifos, the pesticide of concern for the project.

The communicating of our results is being guided by work being done in a second California community monitoring project, which is road testing similar data communications materials. This second project is testing water, produce and urine for the presence of perchlorate. This second project will also influence the implementation of the CECBP. Project partners plan to conduct an evaluation of the communications materials at the conclusion of the project that will be incorporated into implementation plans for the CECBP.

Community engagement in policy change efforts

We expect to discuss explicit policy implications in the December 2009 community meeting at which we present the July 2009 results with the expectation that those discussions will continue into the period following the 2010 sample collection. Item 5 of the Key Lessons section illustrates one specific local policy change (establishment of protection zones around sensitive sites near pesticide applications). This change is supported directly by the kind of data generated in this project together with associated community engagement. Current negotiations with the agriculture commissioner in neighboring Kern County are indicating a probable implementation in 2010 of much more protective buffer zones in that county than what was achieved in Tulare County in February 2008—that is, a one-fourth mile buffer around schools for all pesticides and all application methods. This change can be compared to the previous use of aerial application of restricted-use pesticides with no buffer zone. Community members are currently engaged in a series of public hearings. Data generated among a new group of Tulare County residents—participants in this project—may well help move Tulare to this higher standard.

It is our expectation that the expanded scope of this project (e.g., number of participants, active participation of the State Department of Public Health) will lead to expanded policy change options including influencing state and national regulatory decisions regarding the continued use of chlorpyrifos. Using chlorpyrifos data, in October 2010, PANNA and several other organizations, together with Earthjustice and Farmworker Justice filed a petition with the U.S. Environmental Protection Agency (EPA) to better protect children from exposure to pesticide drift.

KEY LESSONS

- ***It is essential (if at all possible) to have community members with relevant biomonitoring experiences share with potential participants their reasons for participating, familiarity with and confidence in the non-governmental organization (NGO)/government partners, and how receiving individual biomonitoring results personally moved them to join others to push for more health-protective policy.***

- ***Researchers need to be very careful about selection of site, crop, chemical and timing.*** Because growers are not required to announce application of highly toxic pesticides, researchers must use historical pesticide-use data (only available in very few states) and current weather/pest behavior data (when available) to best plan the approximate sampling time. Within that general time frame, the precise day or days of sampling should be selected based on participants' actual on-the-ground experience—seeing, hearing, or, preferably, smelling pesticide applications.
- ***Given the sampling selection challenges, and despite the availability of strong historical pesticide-use data, many anecdotal stories, sampling time observations of application activities, and serious community concern for participants' health, researchers cannot guarantee that biomonitoring sampling levels will be high enough for concern.*** It is therefore crucial to ensure that the project includes a broader focus of pesticides and health and provides opportunity for participants' engagement with general health policy outcomes, such as health education, reporting of pesticide exposures, protections for agricultural workers and so on.
- ***The 2008 summer sampling was conducted with the Centro Binacional Para el Desarrollo Indígena Oaxaqueño (CBDIO) and their Mixteco members.*** The decision to pull out of that community and transfer operations to a neighboring community could have resulted in substantial negative consequences for the community and the project. We avoided such consequences by honest and transparent communications (including a December 2008 community meeting with participants, community members, area pesticide activists and project staff) and by the good fortune that the CBDIO part-time organizer had other funding from CBDIO and was not solely dependent on funding from this project. We explained, and it was agreed, that since this project has the promise of demonstrating how the California State Biomonitoring Program can and should work with vulnerable communities to document their exposure to toxic chemicals, we thought that failure to do so would be bad for communities that could benefit from this kind of study in the future. The summer 2009 sampling involved one individual (and her family) who managed one of the Drift Catcher air monitoring devices in 2008. The summer 2009 sampling also included a community organizer who had worked with and mentored the CBDIO organizer, which ensured some continuity between sampling years. We also recognized that the project had successfully served to engage CBDIO members in ongoing local activities of the statewide coalition of Californians for Pesticide Reform and the Center on Race, Poverty and the Environment and that those newly developed relationships have continued past the biomonitoring project.

- ***Personal stories are powerful.***

Example 1: Two participants in the study that preceded this project (2004-06) and a community organizer testify for banning the organophosphate pesticide chlorpyrifos (the target pesticide of both projects) before a technical committee of California EPA's Office of Environmental Health Hazard Assessment.

Example 2: The media listens and serves as a voice for the community. See [Californians for Pesticide Reform](#) for several media reports.

Example 3: In October 2009 Earthjustice and Farmworker Justice filed a petition calling on the U.S. EPA to include exposures from volatilization drift in its risk assessments and to immediately implement interim mitigation measures for drifting pesticides, including chlorpyrifos. The project's current key community organizer, Luis Medellín, spoke to reporters of his experience.

Community members engaged by good community organizers can influence local policy change. See [news release](#).

KEY PEOPLE

The project's lead organizations:

Margaret Reeves, Ph.D., Senior Scientist, Pesticide Action Network, mreeves@panna.org Project coordination, design and networking support among all project team members and community participants.

Paul B. English, Ph.D., M.P.H., Branch Science Advisor, California Department of Public Health, Environmental Health Investigations Branch, PEnglish@dhs.ca.gov. Project co-principal investigator, lead liaison with analytical laboratory conducting analyses of urine samples.

Lori Copan, California Department of Public Health, Environmental Health Investigations Branch, Lori.Copan@cdph.ca.gov. Co-lead with Sharyle Patton of the results communication component of the project.

Sharyle Patton, Director, Commonweal Biomonitoring Resource Center, spatton@igc.org Co-coordinates project activities and brings to the project hands-on experience with community-based biomonitoring for many different environmental toxicants in communities throughout the United States and abroad.

Karl Tupper, Staff Scientist, Pesticide Action Network North America, karl@panna.org Project lead for the air monitoring component, including training Drift Catcher handlers and overseeing the air sample analysis in collaboration with Stephen Wall (Chief, Outdoor Air Quality Program, Environmental Health Laboratory, California Department of Public Health).

Irma Medellín, Community Organizer and Director of El Quinto Sol de América, a community organization. See PANNA's 2007 story on Irma, which is the lead on recruitment of project participants and participant/community outreach activities.

Luis Medellín, Community Organizer with El Quinto Sol de América. Featured in an October 26, 2009, radio show about pesticide drift. See reporter's notes [online](#).

The following two individuals are community organizers who have worked on this and related pesticide projects in California's Central Valley. Projects include documenting pesticide exposure, popular education on pesticides and health and residents' rights, local and state pesticide policy reform:

Teresa De Anda, Central Valley Representative, Californians for Pesticide Reform, teresa@igc.org, 661-304-4080

Gustavo Aguirre, Assistant Director of Organizing, Center on Race, Poverty & the Environment, aguigustavo@gmail.com, 661-667-0136

Another member of the team will be a health care provider trained to present individual biomonitoring results to individuals about exposures for which there most likely are NO definitive or predictable health outcomes or mitigation steps. This might be the case despite ample evidence of associated negative health outcomes. If the participants include individuals whose first language is not English, then the provider would ideally be bilingual. The following two individuals will provide support to the project's on-the-ground practitioner:

Michael McCally M.D. Ph.D., Mt. Sinai School of Medicine, New York, NY. Will provide expertise and guidance on the topic Body Burden Biomonitoring: Communicating with Participants.

Ted Schettler M.D., M.P.H., Science Director, Science and Environmental Health Network; Science Advisor, Health Care Without Harm. Dr. Schettler has written and lectured extensively on environmental toxicants.

Another member of the team will be someone who can share the limited experiences available on biomonitoring for environmental contaminants with project participants. Affected people need to know they are not alone and need to have examples of others struggling with similar situations. Sharyle Patton and Lindsay project participants will all be on hand to share their experiences with project participants from the Tulare project.

RESOURCES

Pesticide Action Network North America—PANNA (<http://www.panna.org/>) works to replace the use of hazardous pesticides with ecologically sound and socially just alternatives. As one of five PAN Regional Centers worldwide, we link local and international consumer, labor, health, environment and agriculture groups into an international citizens' action network.

- PANNA Organophosphate Page. (The project's target pesticide chlorpyrifos is a member of a class of pesticides called organophosphates.)
- PANNA Organophosphate Report Page—includes (1) a report of the pilot project of biomonitoring for chlorpyrifos in Lindsay, CA, and (2) a chlorpyrifos fact sheet.
- PANNA Drift Catcher Page about community-based air monitoring.

California Department of Public Health, Environmental Health Investigations Branch, <http://www.catracking.com/>, and <http://www.ehib.org/>.

For information on the **California Environmental Contaminant Biomonitoring Program** see: <http://www.oehha.ca.gov/multimedia/biomon/index.html>.

Commonweal Biomonitoring Resource Program

<http://www.commonweal.org/programs/brc/index.html>. The site exists to explain the interpretation and use of biomonitoring data to help understand the movement of chemicals through our lives and landscapes, to support efforts to promulgate health-protective regulations, to better evaluate chemical toxicity. It also provides information, geared toward a lay audience, on how to conduct a biomonitoring study.

Californians for Pesticide Reform (<http://pesticidereform.org>), a (statewide coalition of over 185 organizations collaborating to change statewide pesticide policies and practices to improve and protect public health, sustainable agriculture and environmental quality. Information on the biomonitoring pilot project in California's Central Valley is available [online](#). Scroll to “summary of the study results and recommendations” in the report “Pesticide Contamination in Lindsay Residents' Bodies” and scroll to “profiles of the Lindsay residents” to see personal stories from project participants.

Other resources needed to successfully conduct a community-based biomonitoring project:

- Adequate funding for and recognition of the need for community organizing.
- Access to an analytical laboratory (in-house or commercial) with capacity to analyze the target compound.
- Reliable and accessible pesticide use reporting information (available in California and very few other states) with which to accurately locate target crop, community, timing, and so on.
- A community organization that can recruit project participants, at least some of whom will be willing to speak publicly about their personal chemical exposure (or body burden) and will be willing to speak also on behalf of the resulting mutually agreed upon policy-change goal.