Outcomes of the California Ban on Pharmaceutical Lindane: Clinical and Ecologic Impacts

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Title: Outcomes of the California Ban on Pharmaceutical Lindane: Clinical and Ecologic Impacts

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Running title: Outcomes of the California Ban on Pharmaceutical Lindane.

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Abbreviations:

CDC – Centers for Disease Control and Prevention
CDHS – California Department of Health Services
CEC – Commission for Environmental Cooperation
CSDLAC – County Sanitation Districts of Los Angeles County
FDA – Food and Drug Administration

HCH – hexachlorocyclohexane

IARC – International Agency for Research on Cancer

NARAP – North American Regional Action Plan

ppt – parts per trillion

U.S. EPA – United States Environmental Protection Agency
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Abstract

**Introduction:** There are increasing concerns over the presence and implications of pharmaceutical agents in water. In 2002, California banned pharmaceutical use of lindane due to concerns about water quality, when high levels of this treatment for head lice and scabies were found to be impacting wastewater quality.

**Objectives:** This paper describes the effects the ban has had on wastewater quality, unintentional exposures, and clinical practice. This is the first time that a pharmaceutical has been outlawed to protect water quality. As such, this ban provides a rare opportunity to evaluate the possible or potential outcomes of future public health interventions aimed at reducing pharmaceutical water contamination.

**Methods:** Data on lindane in wastewater treatment plant effluent was compiled for several large plants in California and one outside of California. Data on exposures to lindane were obtained from records of the California Poison Control System. The impact on clinical practice was assessed via a survey of 400 pediatricians.

**Results:** Wastewater treatment plant monitoring showed that lindane declined in California after the ban. Similarly, unintentional exposure calls declined. Most physicians were aware of the ban (81%) and had used lindane previously (61%), but did not notice any difficulties with the ban (78%).

**Conclusions:** The California experience suggests elimination of pharmaceutical lindane produced environmental benefits, was associated with a reduction in reported unintentional exposures and did not adversely affect head lice and scabies treatment. This ban serves as a model for governing bodies considering limits on the use of lindane or other pharmaceuticals.


**Introduction**

Approximately 100 different human pharmaceuticals have been identified at low levels in wastewater treatment plant effluents, surface waters, seaways, groundwater and some drinking waters from around the world (Fent et al. 2006; Hemminger 2005; Kolpin et al 2002). Classes of drugs that have been detected include analgesics and anti-inflammatories, beta-blockers, lipid regulators, anti-epileptics, anti-depressants, oral contraceptives, and antibiotics. Intentional flushing of medications down the toilet, rinsing topically applied medications off in the tub or sink, and excretion of medications in urine or feces are the entry points for most pharmaceuticals into wastewater treatment systems. The federal government and a number of states have discouraged disposal of drugs by flushing them down the toilet, but this does not prevent contamination by rinsing or excretion. Although there are no documented health consequences from these exposures, there are concerns about the impact of long term low-level exposures to medications, especially those that are environmentally persistent, and those that may bioaccumulate in the food chain. Impacts on ecological systems are also of concern, especially in light of discovery of intersex fish in major waterways in the US and their association with exposure to endocrine disruptors (U.S.G.S. 2006). Advanced water treatment technologies can remove many contaminants, however this technology is expensive and may not be affordable for many municipalities. As communities look for alternative ways to manage pharmaceuticals and persistent chemicals in wastewater, the California ban on lindane deserves scrutiny as a potential approach to improve wastewater quality and limit global contamination with persistent organic pollutants.
Lindane, the gamma isomer of hexachlorocyclohexane (γ- HCH) is an environmentally persistent organochlorine insecticide manufactured since the 1940s for both agricultural and pharmaceutical purposes. In agriculture, lindane has been used as an insecticide to treat seeds, crops, lumber/timber, and to treat cattle and other farm animals for ectoparasites. As a prescription medication, lindane is used as a topical treatment for human infestations of head lice or scabies.

Throughout the world, recognition of lindane’s toxicity and its environmental persistence has resulted in an overall decline in use. Lindane has not been produced in the United States for many decades and has undergone progressive limitations on agricultural use (CEC 2006). In August 2006, the U.S. Environmental Protection Agency (EPA) cancelled all remaining registrations for agricultural uses of lindane (U.S. EPA 2006).

When used as a pharmaceutical, acute exposure to lindane has been reported to cause skin irritation, dizziness, headaches, diarrhea, nausea, vomiting, and, in some instances, convulsions and death (Thomson Micromedex 2006). There have been 3 confirmed deaths and 17 reported deaths associated with lindane use (FDA 2003b). All of the deaths occurred when lindane was used in an off-label manner. Neurological effects are the most commonly reported outcomes in the Federal Drug Administration (FDA) adverse effects database. Seventy percent of the reported neurologic events included seizure, dizziness, headache and paresthesias (FDA 2003b). In some instances lindane has caused seizures after one application given according to package directions (FDA 2003a).
Lindane is the least effective common pharmaceutical treatment for head lice when compared *in vitro* to other chemical alternatives including pyrethroids, malathion, or synergized pyrethrins (Meinking et al. 2002). Because of toxicity concerns, in 1995 the FDA advised that lindane be labeled as second line therapy, only to be used after other treatments have failed (FDA 2003b). In 2003, the FDA issued a “black box” Public Health Warning for lindane treatments, reemphasizing that lindane should only be used as second line therapy and recommending use with caution in anyone weighing under 110 pounds, the elderly, and patients with seizure disorders or immunocompromise (FDA 2003b). Despite the cancellation for agricultural use, demonstrated toxicity in humans, and low efficacy in treating pediculosis (Meinking et al. 2002), lindane continues to be available by prescription in the US.

Lindane is a known contaminant in wastewater. Because head lice and scabies treatments are rinsed down the drain after usage, lindane readily enters wastewater treatment plants. Wastewater treatment plants are not designed to remove lindane. Therefore, much of the lindane passes through and enters downstream lakes, rivers, and the ocean (U.S. EPA 2002). California has stringent water quality standards for lindane, including a criteria of 19 parts per trillion (ppt) for existing or potential drinking water sources (U.S. EPA 2000). This standard is based on long term human cancer risk from ingestion.

Wastewater treatment engineers in Los Angeles calculated that a single treatment for head lice or scabies contains enough lindane to bring 6 million gallons of water above this California water quality standard (CSDLAC 2001). To address these concerns, the County Sanitation Districts of Los Angeles County, the City of Los Angeles and the National Pediculosis Association jointly conducted an outreach campaign in 1999 to
provide information to clinicians on alternatives to lindane and to recommend limiting its use (CSDLAC 2000). The outreach campaign consisted of three direct mailings to target audiences and mass media exposure. Direct mailings included flyers (in seven languages), refrigerator magnets, head lice combs, and rolodex cards. Presentations were made addressing the issues of the campaign. Mass media included newspaper, radio, and television coverage. The target audiences included doctors, hospitals, pharmacists, school nurses, and day care centers in Long Beach and Burbank, CA. There was also a relevant web site and a toll-free hotline established.

In 2000, the California legislature passed, with no opposition on record, a ban on the sale of all pharmaceutical lindane products effective in January 1, 2002 (State of California 2000). To determine the potential impact of this ban on water quality, data were obtained from wastewater treatment plants on wastewater lindane concentrations. Also, to determine the number of acute poisonings due to lindane before and after the ban, phone calls to the California Poison Control System were reviewed. To more systematically investigate the impact of the lindane ban on healthcare providers’ prescribing practices in California, a survey of pediatricians was undertaken three years after the ban’s effective date.

Methods

Wastewater Concentrations

Annual mean concentrations of lindane in ppt were examined for several large treatment plants in California. Historical water lindane concentrations were obtained directly from the following agencies: County Sanitation Districts of Los Angeles County’s Joint Water
Pollution Control Plant, serving over three million people in Los Angeles County, California; the City of Los Angeles’ Hyperion Treatment Plant, also serving over three million people in Los Angeles County, California; the Orange County Sanitation Districts’ Plants 1 and 2, serving 2.5 million people in Orange County, California; and the San Jose/Santa Clara Water Pollution Control Plant, serving 1.5 million people in Santa Clara County, California. Concentrations of lindane entering the plants were examined except for the San Jose/Santa Clara Water Pollution Control Plant, where adequate data were not available. For this treatment plant, concentrations of lindane exiting the plant were examined. Because lindane is not widely analyzed at wastewater treatment plants outside of California using sensitive analytical methods, limited wastewater lindane data is available outside of California for comparison. However, data for the Clermont County Sewer District’s Middle East Fork Wastewater Treatment Plant, serving approximately 30,000 people in Clermont County, Ohio was obtained. Routine monitoring of wastewater for lindane at these treatment plants was performed monthly or quarterly, and was based on samples taken over a 24-hour period.

California Poison Control System Calls and Prescribing Trends for Lindane

The California Poison Control System case management database was searched using Visual Dotlab version 4.3.1 (WBM Software 2007, Fresno, California) for years 1998-2006 for calls related to unintentional exposures to lindane. Product-specific codes (Thomson MICROMEDEX® Healthcare Series Vol. 131, Poisindex ®) for personal care products containing lindane were used to identify 21 shampoos, creams and lotions. A tally of annual calls related to all unintentional exposures was obtained as a denominator.
To examine lindane prescribing trends in California, Medi-Cal fee-for-service pharmacy paid claims data for lindane were compiled for the fiscal years 1997 through 2002 (CDHS 2007). Nationwide data on the total number of lindane prescriptions by calendar years 1997 through 2006 were also compiled (Verispan, Inc 2007).

Survey

A written survey was developed to elicit information about provider practice characteristics, provider awareness and perception of the California lindane ban, and current treatment preferences for head lice and scabies. Institutional Review Board approval from the Committee on Human Research at the University of California, San Francisco was obtained prior to mailing the survey. Among a population of 4,179 non-emeritus members of the American Academy of Pediatrics, California district, 400 members were selected at random to receive the survey. Each selected participant was mailed three separate surveys one month apart with a return envelope. Data analysis was performed using Stata Version 9 (College Station, Texas).

Results

Wastewater Concentrations

Before Los Angeles County outreach efforts on pharmaceutical lindane began in 1999, the average wastewater concentration of lindane was 36 ppt. Though the concentration has declined steadily since that time, it remained elevated at several major California
wastewater treatment plants at the time the lindane ban in California was enacted. By 2006, four years after the ban took effect, lindane concentrations had dropped to almost undetectable concentrations in California. Although there is limited availability of lindane wastewater data outside of California, data from one Ohio treatment plant (Clermont County Sewer District’s Middle East Fork Wastewater Treatment Plant) indicates that lindane concentrations remained significantly elevated in Ohio after the California ban was enacted. Figure 1 shows the mean concentration of lindane at the California treatment plants.

*California Poison Control System Exposure Calls and Prescribing Trends for Lindane*

In 1998, there were 135 calls for unintentional lindane exposure per 100,000 calls to the California Poison Control System. This volume declined somewhat in the year 2001 (50 calls per 100,000) and then fell to near zero in the years following the ban (2 calls per 100,000 per year for 2004-2006). Figure 2 depicts annual calls to the California Poison Control System for the years 1998 to 2006 for unintentional exposures related to lindane.

Prescriptions for lindane filled by the Medi-Cal state insurance program dropped from over 114,000 in 1997 to 11,366 in 2001 and 34 in 2002 (reflecting delayed payment for pre-ban prescriptions) paralleling the decline in wastewater concentrations (Figure 3). Nationwide prescriptions for lindane during the same period declined similarly. In January 2002 California sales ended abruptly coinciding with the ban. In contrast, since 2002 the rate of decline in national sales has slowed, as illustrated in Figure 3.
Surveys

Of the 400 mailed surveys, 171 (43%) were returned after three mailings. No information was available for the non-responders. Thirty-two surveys from non-practicing physicians were excluded from the final analysis. In addition, four incomplete surveys were dropped from the group. The analysis was performed on the remaining 135 responses.

Responder Characteristics

Table 1 describes the practice characteristics of the respondents. The majority (77%) of respondents practiced more than 30 hours per week. Over one-half (55%) of the pediatricians practiced in a group private practice, 14% were in an HMO setting, and 13% of respondents were in solo practice. Approximately half (53%) of respondents were in practice for less than 15 years.

Pediatricians differed substantially in the number of cases of head lice and scabies they typically manage in their practice. Seventy respondents (52%) reported managing 3 to 14 cases of head lice in the last 3 months, and 60 respondents (45%) managed fewer than 2 cases; only 3% of the providers managed more than 15 cases in the last 3 months. Similarly, fifty pediatricians (37%) managed between 3 and 14 cases of scabies in the last 3 months, and 79 (59%) managed 2 or fewer cases; only 4% managed more than 15 cases in the last 3 months.

Response to Lindane Ban
More than half (61%) of pediatricians reported using lindane prior to the ban, and the vast majority (81%) were aware of the ban. Of the providers who reported using lindane prior to the ban, virtually all (94%) reported changing their prescribing practices as a result of the ban.

Most respondents (78%) did not notice any difficulties after the lindane ban. However, 30 providers did report difficulties after the ban. Of these, most used lindane prior to the ban (26/30 or 87%) and only 4/30 did not report prior lindane use. Those providers who reported that they had used lindane pre-ban and noticed difficulties after the ban were far more likely to be in solo private practice (35% compared to 7%) and to have been in practice more than 15 years (58% compared to 44%). Providers reporting difficulty after the ban cited resistant lice as the main reason (97%), however, overall reports of resistant scabies were minimal (5%), as were increased cases of lice (7%) or scabies (1%). There were no significant differences among volume of head lice or scabies cases seen in the prior 3 months between providers who reported difficulties and those who did not.

Treatment preferences
The majority of respondents (69%) stated their first-line treatment preference for head lice was 1% permethrin, followed by 5% permethrin (9%) and other over-the-counter methods including pyrethrum (8%). Respondent preference for second line head lice treatment was malathion (51%) followed by 5% permethrin (19%). For scabies treatment, the majority (92%) of respondents expressed preference for 5% permethrin (92%), followed by crotamiton (5%). Second line treatment preference for scabies
included crotamiton (32%), followed by 5% permethrin (25%), malathion (21%), and others (22%).

**Discussion**

*Wastewater Concentrations*

Because there is little to no agricultural use of lindane in urban areas of California (CDPR 2007), elevated wastewater concentrations of lindane were attributed to pharmaceutical lindane usage (CSDLAC 2001). As Figure 1 illustrates, average concentrations of lindane were declining after 1991, paralleling reductions in prescriptions filled in California by Medi-Cal (Figure 3) and likely reflecting the availability of effective and safe over-the-counter alternatives. Permethrin, for instance, was first available in 1986 and made over-the-counter in 1990. Though we were unable to establish historical retail prices of lindane, the lowest average wholesale price (AWP) of lindane shampoo relative to that of permethrin went from 20% to 110% from 1990 to 1999 (Kapusnik-Uner J, personal communication). In addition to the introduction of alternative treatments and public health advisories, medical treatment recommendations in the literature, and price increases of lindane may have also contributed to the gradual decline in use of lindane.

After the pharmaceutical lindane ban went into effect, lindane concentrations at California wastewater treatment plants dropped to essentially non-detectable levels. Although there is limited data available outside of California for comparison, one Ohio wastewater treatment plant demonstrated significantly elevated lindane concentrations after the California ban was enacted. This suggests that the ban played a major role in the
decreased California wastewater concentrations relative to other factors such as the cost of pharmaceutical lindane and availability of alternatives.

Unintentional Ingestions and Prescribing Trends for Lindane

Lice and scabies infestations are a worldwide problem, especially prevalent in institutions such as schools, prisons, and nursing homes. Infestations are usually not life-threatening, but they can be persistent, recurring, and cause considerable frustration and embarrassment in families. Whereas lindane was once an inexpensive and effective treatment, it is now more expensive than many alternatives (West 2004) and has been associated with widespread resistance throughout the world (Heukelbach and Feldmeier 2006; Ko and Elston 2004).

A recent report shows that prescriptions for lindane in the US have declined by 87% over the last twelve years (U.S. EPA 2007). Yet, there were 242,000 prescriptions written for lindane in 2005 (U.S. EPA 2007) and over 186,000 in 2006 (Verispan, Inc 2007) and 870 unintentional ingestions of lindane in the United States during the five year period 1998-2003 (CDC 2005b). Though there was a dramatic decline in lindane prescriptions filled under the Medi-Cal program in California in the five years prior to the ban, there were still over 11,000 filled in the year prior to the ban. Despite lindane’s use as a second-line drug, unintentional ingestions from lindane were more likely to produce illness than ingestions of all alternative medications combined (pyrethrin/piperonyl butoxide, permethrin, and malathion) (CDC 2005b). In California, in contrast, calls related to lindane exposure to the California Poison Control System, declined gradually from the years 1998 to 2002, but went to near zero following the ban. This information highlights the fact that, although the pharmaceutical use of lindane in states other than California
has declined, there is still a significant volume of use and continued morbidity from unintentional exposures.

Summary of survey results

Three years after pharmaceutical use of the pesticide lindane was banned in California, a survey of practicing California pediatricians indicates over 80% of physician respondents were aware of the ban and a similar majority reported no difficulties complying with the ban. Despite outreach efforts by the State Department of Health Services and county public health officials, nearly two thirds of pediatricians were prescribing lindane at least occasionally before the ban and had to change their prescribing practices as a result of the ban. The minority of providers who were using lindane and noticed difficulties after the ban were more likely to be in solo practice and to have been in practice more than 15 years, suggesting a subpopulation of pediatricians who may benefit from education about alternative treatments for head lice and scabies. There was concordance among providers for current first line treatments for head lice and scabies.

Most providers did not report an increase in resistance of lice or scabies following the ban on lindane. One limitation of our survey was that it was not sensitive enough to distinguish between an increase in resistance pre-dating the ban from any additional resistance temporally associated with the ban or thought to be related to the ban. Most chemical treatments for pediculosis will result in resistance over time (Downs 2004). Written comments on our survey from providers suggest either there was no additional increase in resistance after the ban or that any increase was unrelated. For instance, written responses from providers included these comments: “there seems to be an
inexplicable decrease in both infestations;” “I think resistance and ban of Kwell are entirely unrelated;” and “only seeing rare clinical challenges now.” As well, the California Department of Public Health has not identified an impact of the ban on either head lice of scabies outbreaks (Husted S, personal communication).

This study is, to our knowledge, the first evaluation of the clinical and environmental effects of the California lindane ban. The main limitation of our survey was a survey response below 50%, although this response rate is similar to that from other published studies using mailed surveys (Asch et al. 1997; McMahon et al. 2003). There is no information about the non-responders. This low response rate could introduce bias. For example, if providers who experience problems are more likely to respond to the survey, this would overestimate reported difficulties following the lindane ban.

**Alternatives to Lindane for Head lice/scabies Treatment**

The current recommended first-line treatment of head lice is over-the-counter 1% permethrin (Frankowski and Weiner 2002). Pediatricians in the California survey generally seemed to be aware of this and adhere to the guidelines. A recent Cochrane review found no evidence that any one pediculocide, including malathion, permethrin, and synergized pyrethrins was more effective than another, although only 4 of 71 randomized, placebo-controlled studies met the inclusion criteria (Dodd 2001). Oral ivermectin has also been used when topical treatments cannot be used or when all other therapies have failed, although it is currently not FDA approved for this use (The Medical Letter 2005).
A complete review of alternatives for the treatment of head lice and scabies is beyond the scope of this paper; the reader is referred to recent publications for such a discussion (Jones and English 2003; Karthikeyan 2005; Meinking 2004; Walker and Johnstone 2000). Several recent uncontrolled studies on non-chemical treatments for head lice - relying on suffocation and desiccation – also show promise (Goates et al. 2006; The Medical Letter 2005; Pearlman 2004). Another recent small single blinded, randomized study comparing common pediculocides to wet combing, or practicing nit removal by using a fine toothed comb through wet hair, found wet combing to be effective (Hill et al. 2005). In addition to their non-toxicity to humans and the environment, these methods have the advantage of avoiding development of resistance.

Environmental Concerns

As of today, lindane may only be sold in the U.S. for use as a second-line treatment for head lice and scabies. However, the continued use and production of lindane raises international environmental pollution concerns and ethical issues.

For every ton of lindane that is produced, approximately 9 tons of toxic waste by-products are generated (CEC 2006). Lindane is the \( \gamma \)-isomer of hexachlorocyclohexane (HCH) and is isolated from a mixture of eight isomers in technical-grade HCH (CEC 2006). None of the other HCH isomers have commercial use, and several are significantly more toxic and persistent than lindane itself, creating a disposal problem that has been poorly managed in many countries. Lindane production and use has resulted in contamination of products significant to children, such as butter and milk (Pardio et al. 2003; Waliszewski et al. 2003). In both animal and human studies, lindane
and other HCH isomers have been associated with toxic health effects, including neurotoxicity, increased cancer risk, reproductive harm, and immune suppression (ATSDR 2005; IARC 1998). Though long lived in the environment, studies have shown that in countries that have restricted or banned lindane, levels of HCH in breast milk have declined over time (Jensen and Slorach 1991; Konishi et al. 2001; Schade and Heinzow 1998). Similarly, biomonitoring data from the United States found levels of lindane below the limits of detection, and lower than in people from many other countries (CDC 2005a). The β–HCH isomers are still found in measurable concentrations in Americans and were higher in Mexican Americans (CDC 2005a).

Over the past two decades, there has been a steady decline in the production and use of lindane. Worldwide production of lindane is estimated to have decreased from 38,000 tons per year in 1986 to approximately 3,222 tons per year during 1990-1995 (IPEN 2007). More recent figures are not available. However, it is estimated that between 2-4.8 million tons of HCH waste by-products are present worldwide (Vijgen 2006). These waste products are highly persistent chlorinated compounds and thus there is no easy and effective way to dispose of them or remediate sites of production, creating a costly and hazardous situation. Production of lindane has moved from industrialized to developing countries, raising ethical issues since the manufacturing country becomes the dumping ground for the waste. Documentation about production is sparse. Because it is joining the European Union, Romania is slated to discontinue production at the end of 2007. The remaining lindane production sites are thought to be only India and China (CEC 2006; Schade and Heinzow 1998).
Lindane is registered for use in 17 countries, has been completely banned in over 50 countries, and has restricted use in 33 countries (CEC 2006). In recognition of the global pollution resulting from persistent organic pollutants such as lindane, there have been international efforts to regulate and eliminate these substances. Mexico, the US, and Canada, for instance, have collaborated in the North American Regional Plan (NARAP) to eliminate or ban the use of lindane where warranted and reduce the risks from exposure to HCH isomers (CEC 2006). In addition, Mexico has nominated lindane and other HCH isomers as candidates for the Stockholm Convention, a global treaty to protect human health and the environment from persistent organic pollutants.

In summary, there are safer and more effective treatment alternatives for head lice and scabies. The experience in California has resulted in ecologic benefits, including the virtual elimination of lindane from California wastewater, and in the reduction of unintentional exposure calls to the Poison Control System. Our survey results suggest the ban on the pharmaceutical use of lindane has not posed a significant problem for clinicians. Use and wastewater contamination did decrease in California during the years prior to the ban, likely resulting from California public outreach efforts, the FDA advisories, recommendations in the medical literature, and the availability of alternatives. However, use continued and it was ultimately the legislative ban that was correlated with improvements in California wastewater quality, a decrease in unintentional exposure calls, and the cessation of clinician use of lindane. Given the recognition of lindane and other HCH isomers as toxic and persistent chemicals with health consequences, coupled with the ethical issues of manufacturing in developing countries for use elsewhere, the
harms of use and production may outweigh any residual benefit from maintaining it as a second line therapy.
References


Appendix 1.
Explanatory Note: Information on lindane pricing is based on available average wholesale prices (AWP) from 1990 to 1999. AWP = average wholesale price or wholesaler's published price to buying entities (pharmacies, hospitals, etc. and may vary by reporting source); AWP represents published catalogue or list prices and may not represent actual transactional prices. Reprinted with permission by First DataBank, Inc. All Rights Reserved © 2007. Pricing methodology available at: 
Table 1. Pediatrician Survey Respondent Characteristics

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Figure Legends.

Figure 1. Mean lindane concentrations (ppt) at four California wastewater treatment plants: Joint Water Pollution Control Plant (JWPCP), Hyperion Treatment Plant (HTP), Orange County Sanitation Districts’ Plants 1 and 2 (OCSD), San Jose/Santa Clara Water Pollution Control Plant (SJSC). All data is influent except for effluent data at SJSC. The California standard for lindane for surface water bodies that are existing or potential drinking water sources is 19 ppt. Arrows indicate the year permethrin became over-the-counter (1990), the outreach campaign in Los Angeles County began (1999), and the year the ban was passed (2000). The ban (2002) is marked with a dashed line.

Figure 2. Annual number of calls regarding unintentional exposures to lindane per 100,000 calls, 1998-2006. Solid bars are pre-ban calls and hashed are post-ban. Source: California Poison Control System.

Figure 3. Number of Prescriptions of Lindane according to Medi-Cal data for years 1997 through 2002 compared to nationwide prescriptions for years 1997-2006.
Figure 1.
Figure 2.