

1998 POLLUTION PREVENTION LEADERSHIP GRANT PRE-PROPOSAL

LINDANE USAGE REDUCTION IN LOS ANGELES COUNTY

Key Agency Contact: Margaret Nellor, Head, Monitoring Section
County Sanitation Districts of Los Angeles County
1955 Workman Mill Road, P.O. Box 4998 Whittier, CA 90607
(562) 699-7411, x2801 fax (562) 692-5103
mnellor@lacsds.org

BACKGROUND

The purpose of the project described in this pre-proposal is to reduce the environmental release of the chemical lindane, also known as γ -hexachlorocyclohexane or γ -benzene hexachloride, in Los Angeles County, California through the implementation of a targeted pollution prevention program. Lindane is a persistent, bioaccumulative, and toxic pesticide, used primarily for treatment of head lice and scabies in humans. It is also registered in California for use in agricultural applications and in dog shampoo for tick and flea control. Lindane causes adverse health effects in humans, including central nervous system toxicity, adverse liver and kidney effects, and reduced ability to fight infections. Lindane has been reported to cause liver cancer in laboratory rodents and the Department of Health and Human Services has determined that it may reasonably be anticipated to cause cancer in humans¹. Seizures and, in rare instances, death have been reported after excess dosage, over-exposure, frequent reapplications, and accidental ingestion of lindane used in lice control products. In extremely rare cases, seizures have also been reported when lindane is used properly for lice control².

Lindane is also a pollutant of concern with regard to the protection of surface water quality and aquatic life. One of the pathways for releasing lindane to the environment is through the discharge of treated wastewater, which is of concern to wastewater agencies in Southern California, including the County Sanitation Districts of Los Angeles County (Districts). The Districts are a confederation of 26 independent special districts that serve the water pollution control and solid waste management needs of approximately five million people in Los Angeles County. Fifteen of the districts have collectively constructed an extensive regional sewerage system known as the Joint Outfall System (JOS), which conveys and treats approximately 450 million gallons per day (MGD) of wastewater from 72 cities and unincorporated county areas. The JOS consists of seven treatment/water reclamation plants and 1,200 miles of large diameter, trunk sewers that form a network connecting the treatment plants and ocean outfalls off Whites Point on the Palos Verdes Peninsula. The Districts also operate four water reclamation plants in northern Los Angeles County serving the communities in and around the cities of Santa Clarita, Lancaster and Palmdale. On an annual basis, over 50 MGD of reclaimed water is reused for applications including groundwater recharge, landscape irrigation and industrial uses. The remainder is discharged to inland surface waters that are effluent dependent water bodies. The beneficial uses of the receiving waters are diverse and include groundwater recharge, water recreation, warm fresh water habitat, wildlife habitat; commercial and sport fishing; wildlife habitat; rare, threatened or endangered species; and spawning, reproduction, and early development of fish. Solid material removed during treatment is digested and dewatered. The resulting biosolids are either landfilled or beneficially reused for agricultural land application.

Wastewater discharged from the Districts' treatment plants currently contains an average of approximately 30 parts per trillion (ppt) of lindane and maximum concentrations up to 240 ppt have been found. While this has been acceptable in the past, new water quality standards for California have been proposed³, which establish water quality criteria for the protection of aquatic life and human health. In the latter case, the criteria are intended to minimize adverse human effects due to substances in ambient water. The proposed rule, which is expected to be finalized in 1998, establishes a criterion of 19 ppt of lindane for protection of human health via consumption of water and aquatic

¹ Draft Toxicological Profile for Alpha-, Beta-, Gamma-, and Delta-Hexachlorocyclohexane, U.S. Department of Health & Human Services, September 1997.

² Physicians Desk Reference, 52nd Edition, Medical Economics Company Inc., 1998.

³ Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California; Proposed Rule, August 5, 1997 Federal Register; pg. 42159.

organisms. This criterion will be applied as an effluent limit for most of the Districts= water treatment plants, a limit which is currently not attainable. Other publicly owned treatment works (POTWs) in Southern California, including the City of Los Angeles, are expected to have a similar problem meeting the new 19 ppt lindane limitation.

While meeting the new water quality limitation for lindane is of primary interest, the Districts are also concerned about the multi-media effects of lindane entering their sewerage system. Wastewater that is recharged to groundwater is first land-applied then percolates into groundwater supplies. Lindane in the land-applied water could contaminate soil and be taken up and bioconcentrated by terrestrial organisms. Lindane also bioaccumulates in aquatic organisms from surface water exposure pathways⁴. Although lindane has not been detected in the Districts= biosolids, there is a potential pathway for lindane to be an air pollutant via dust from land-applied biosolids or as a potential groundwater contaminant through soil contamination.

CHOICE OF CONTROL STRATEGY

Because lindane is a highly regulated pesticide, there are only three routes for lindane to enter the Districts= sewerage system. The main pathway is believed to be from human treatments for lice and scabies with lindane-containing products. Lice are insects that live on the human bodies in hairy areas. A 1% lindane shampoo is available with a physician=s prescription to control lice. After use, shampoo is washed into the sewer system. Similarly, scabies is a mite that lives in the human skin. A 1% lindane lotion available with a physician=s prescription can be applied to the skin to control scabies, with the lotion washed to the sewer system following application. A typical lice or scabies treatment uses 1.5 oz of the 1% lotion, or 0.015 oz of the lindane active ingredient. In comparison, the mean influent concentration of lindane to the Districts= treatment plants is 60 ppt; the Districts treat 500 MGD of wastewater, for a total loading of 4 oz/day to the Districts= system. This means that only 267 applications of lindane-containing products daily can account of all of the lindane in the Districts= system, or one application for every 19,000 people.

The second route for lindane to enter the sewer system is via use of pet shampoo containing lindane. There is only one lindane-containing pet shampoo registered for use in California: Flea Stop Lindane Flea & Tick Dip & Mange Control, which contains 6.5% lindane. The California Department of Pesticide Regulation has jurisdiction over the sale of this product. Although it is not within the scope of this grant, the Districts intend to pursue a possible ban of this product within Los Angeles County or the State of California with the California Department of Pesticide Regulation.

The third route for lindane to enter the sewer is via human ingestion of food products containing residual lindane. Lindane may pass through the body and enter the sewer system. Studies in the early 1980s indicated that the average human ingestion of lindane was 2 ng per kg of body weight per day.⁵ Assuming 5 million residents each weighing 150 pounds, the total consumption of lindane by all residents in the Districts= service area is only 0.024 oz/day.

This is quite small compared to the total loading of 4 oz day, and thus focusing on ingestion of food products as part of a control strategy would not be a particularly effective means for reducing sewer levels of lindane. Therefore, the focus of this project will be to reduce usage of lindane-containing products for human pest control.

SUMMARY OF PROPOSED PROJECT

Purpose. The purpose of this project will be to reduce usage of lindane for human lice and scabies control by developing an outreach program that provides information about the potential harmful effects of lindane on users and potential use alternatives. The Federal Food and Drug Administration (FDA) has jurisdiction over human uses of lindane, and only allows lindane-containing treatments to be sold by prescription. In 1996, the FDA examined adverse health effects to consumers using lindane and concluded that misuse of lindane can be harmful. As a result, the FDA recommended that lindane only be used as a treatment of last resort when other remedies for lice and scabies have failed, or when the user is intolerant of other remedies. There are less toxic treatments available for both lice and scabies. Permethrin-based shampoos and pyrethrin-based shampoos, which are available over-the-counter, have both been shown to be as effective as lindane for lice control.^{6,7} Permethrin has been shown to be more effective for scabies control than

⁴ Draft Toxicological Profile for Alpha-, Beta-, Gamma-, and Delta-Hexachlorocyclohexane, U.S. Department of Health & Human Services, September 1997.

⁵ Gunderson EL AFDA Total Diet Study, April 1982-April 1984: Dietary Intake of Pesticides, Selected Elements, and Other Chemicals@ J Assoc Off Anal Chem 71:1200-1209, 1988 and Gatrell MJ, Craun JC, Podrebarac DS, et al, APesticides, Selected Elements, and Other Chemicals in Adult Total Diet Samples, October 1980-March 1982" J Assoc Off Anal Chem 69:146-161, 1986.

⁶ Vander Stichele RH, Dezeure EM, Bogaert GM ASystematic Review of Clinical Efficacy of Topical Treatments for Head Lice@British Medical Journal September 2, 1995 311(7005):604-8.

lindane⁸ and is available by prescription. Because lindane can only be prescribed by a physician, this project will focus on educating physicians and other appropriate health care professionals who deal with children on the risks associated with lindane usage and the effectiveness of alternative products. The project will also target school nurses who disseminate information on head lice treatment, and reach out to parents with information provided by physicians and school nurses. Unfortunately, head lice are becoming increasingly resistant to all chemical agents including lindane and its less toxic chemical alternatives. A key point of the outreach campaign will be education on proper head lice treatment including mechanical means. Lice killing agents are effective at killing live lice, but not at thoroughly killing lice eggs, known as nits. Nits are glued to an infected person's hair by adult lice and are difficult to remove. By the time a person has been diagnosed with lice, there are numerous nits present in their hair. If any viable nits remain after chemical treatment of hair, the nits will hatch and reinfestation will take place. Therefore, it is essential that all nits be removed after chemical treatment for lice. However, removal of the nits can be extremely difficult. Lice combs that come with over-the-counter shampoos are ineffective for this job, are painful for the patient being treated, and do not remove nits well even when used properly. A non-profit organization dedicated to protecting children from the misuse and abuse of pesticides for lice and scabies, the National Pediculosis Association (NPA), has developed a nit comb that is easy and painless to use and effective at nit removal. To encourage thorough nit removal, the Districts will partner with NPA on this project to distribute combs to physicians and school nurses to hand out to families affected by head lice. NPA will provide the combs at their cost and will also provide staff time to aid in developing educational materials. Proper nit removal should allow lice to be eradicated in a single chemical dosage of an over-the-counter shampoo, thus eliminating the need to perform additional chemical treatments with other agents such as lindane. The use of the nit removal combs provide a true pollution prevention solution to the use of lindane, significantly reducing the need to use chemical to control lice outbreaks using a non-toxic method.

Another key component of the outreach campaign will be overall education of physicians, school nurses, and parents on head lice, including information on prevention, routine screening, and early detection. Preventing head lice transmission should reduce necessary chemical usage, while routine screening can help prevent outbreaks from spreading. Early detection is also important to prevent lice from spreading and to make treatment easier.

Strategy/Approach. This project will consist of an initial pilot project conducted under the direction of a Technical Advisory Committee (TAC). The TAC would be formed at the onset of the study to help with the final design of the pilot program and outreach materials. The TAC would include professionals from the Los Angeles County Health Department, the Los Angeles County Medical Association, the California School Nurses Association, school administrators, representatives from one or more health maintenance organizations, the NPA, and the City of Los Angeles. Rather than initially focusing on all of Los Angeles County, one or two school districts and health maintenance organizations would be targeted as a pilot project. The lessons learned from the pilot project would then be applied to an outreach program on a larger scale. The NPA will help develop educational materials and a consulting firm would be retained to help develop the campaign and perform the outreach. Outreach materials, including a possible video, targeting pediatricians, family care physicians, and schools would be prepared with oversight by the TAC. It is hoped that an agency such as the Los Angeles County Department of Health Services will be willing to lend its logo to the materials to provide credibility and acceptability; other agencies and groups will be solicited for sponsorship. The materials would also be distributed in conjunction with medical associations such as the Los Angeles County Medical Association and the California Association of School Nurses.

A brochure would be made for distribution to families, describing lice prevention strategies and less toxic and non-toxic alternatives to lindane usage, emphasizing prevention and the FDA's message that lindane should only be used as a treatment of last resort. The brochure would also mention that unused shampoo should not be poured down the drain but saved in case of future outbreaks or brought to a household hazardous waste roundup. The brochure would be translated into several languages common in Los Angeles County including, Spanish and Chinese, and given to physicians and school nurses to distribute to families. The brochure will be given to physicians and school nurses for distribution to parents. Along with the brochure, several lice combs will also be given to each health care professional for distribution to lice-infected patients.

The City of Los Angeles Bureau of Sanitation will be a partner in this project. The City of Los Angeles Bureau of Sanitation is the other large provider of sewerage services in Los Angeles County. It serves the millions of residents

⁷ Brown S, Becher J, Brady W. "Treatment of Ectoparasitic Infections: Review of the English-language Literature, 1982-1992" *Clin Infect Dis*, April 1995, 20 Suppl 1:S104-9.

⁸ Elgart ML. "A Risk-Benefit Assessment of Agents Used in the Treatment of Scabies" *Drug Saf* June 1996 14(6):386-93.

in the City of Los Angeles. The City of Los Angeles is currently having difficulties meeting its lindane limitation at one of its wastewater treatment plants and is therefore extremely interested in reducing lindane usage. The City of Los Angeles will provide staff time toward the project, as well as providing technical help and data on lindane levels in its wastewater treatment plants. Because it is anticipated that other POTWs in Southern California and perhaps around the State of California will have difficulty meeting lindane limitations under the new water quality standards, one aspect of this project will be transferring information on the campaign to other POTWs and interested parties. The educational materials prepared will be prepared so that they can be used by other interested parties with little or minor modifications. Educational materials will be made available in both electronic and hard copy formats.

Goal. The goal of this project is to reduce lindane discharges to the Districts= water reclamation plants so that lindane concentrations in treated effluent are less than 19 ppt. Lindane usage is directly related to influent concentrations at the treatment plant since all lindane products are washed to the drain after use. To achieve an effluent concentration of 19 ppt, a 50% reduction in lindane usage in the Districts= service area must be achieved. The impact of the outreach campaign will be measured by sampling and analysis of the influent and effluent concentrations of lindane at one of the Districts= treatment plants. The San Jose Creek East Water Reclamation Plant (SJC-E WRP) was chosen for intensive analysis since this plant will be affected by the 19 ppt lindane limitation and because it treats approximately 60 MGD of wastewater, and thus serves a large enough area to give a good averaging of behavior. Influent and effluent sampling for lindane would be performed daily at SJC-E WRP for one week semi-annually. Over the three year project this would result in six sampling episodes of seven days each, which will be sufficient to identify trends in lindane discharges. Routine semi-annual lindane sampling is already performed at most of the Districts= other treatment plants and we will continue to track lindane presence in the rest of the Districts= service area.

PROJECT SCHEDULE AND SPECIFICATION OF TASKS AND DELIVERABLES

TASKS AND SCHEDULE

Task	Quarter											
	1	2	3	4	5	6	7	8	9	10	11	12
Prepare Request for Proposals	X											
Issue Request for Proposals and choose firm		X										
Formation of advisory board	X	X	X									
Prepare educational materials			X	X	X	X						
Design of pilot outreach program			X									
Conduct pilot outreach program				X	X							
Design of full outreach program					X	X	X					
Conduct full outreach program								X	X	X		
Perform sampling	X		X		X		X		X		X	
Prepare final report											X	X

Deliverables. Semi-annual progress reports will be submitted on the project. The reports will include a statement of progress made and milestones accomplished, treatment plant sampling data to indicate lindane usage levels, a budgetary statement, and copies of any educational materials that have been prepared. If necessary, quarterly reports can be submitted in lieu of semi-annual reports. At the completion of the project, a full report will be prepared, including a full project description, all lindane analytical data that was collected, copies of all education materials developed, indications of how the educational materials were distributed and to whom, and lessons learned during the project. In addition, copies of all educational materials developed will be made available in camera-ready and electronic formats.

PROPOSED BUDGET

GRANT FUNDS

Contracts:

Consulting firm to conduct outreach campaign:	\$66,000
Lindane analysis (84 samples at \$171/sample):	\$14,000

Equipment:

Purchase of nit combs (2600 at \$7.50/each)	<u>\$20,000</u>
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Total Grant Funds:	\$100,000
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MATCHING FUNDS

Staff Time:

Senior Engineer time (240 hours at \$51/hr):	\$12,240
Data analysis, deliverable preparation, working with consultant, TAC, POTWs	

Division Engineer II time (90 hours at \$64/hr):	\$5,760
Contract preparation and oversight	

City of Los Angeles staff (120 hours at \$40/hour)	\$4,800
Provide lindane data, TAC	

NPA staff at (60 hours at \$20/hour)	\$1,200
Preparation of outreach materials, TAC	

Equipment:

NPA equipment donation (2600 nit combs at \$7.50 off each)	<u>\$19,500</u>
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Total in-kind goods and services:	\$43,500
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STATEMENT OF EXPERIENCE/CAPABILITY

The project will be managed by the County Sanitation Districts of Los Angeles County. The Districts have played an active role in reducing pollution in their service area, including encouraging recycling, sponsoring and co-sponsoring over 200 household hazardous waste roundups that have collected over 400,000 gallons of oil, 1.2 million gallons of paint, and 35,000 car batteries. The Districts also helped to develop and distribute an educational unit for grade school students on environmental responsibility entitled AThink Earth.®

The project manager and key agency contact will be Margaret H. Nellor. Ms. Nellor is the Head of the Monitoring Section and is responsible for the overall administration of the Districts' wastewater quality and compliance program, water reclamation program, ocean monitoring program and biosolids management program. Ms. Nellor received an M.S. in Environmental Health Engineering and a B.S. in Civil Engineering from the University of Texas at Austin, is a registered civil engineer and is a Diplomate in the American Academy of Environmental Engineers. Her 20 years of professional experience include water and wastewater quality management, source control management, pollution prevention, and wastewater research. She has served as the manager for both the County Sanitation Districts of Los Angeles County's and County Sanitation Districts of Orange County's source control programs. She is the Chair of the Association of Metropolitan Sewerage Agencies' Watershed Management Workgroup, Co-Chair of the Environmental Protection Agency's Effluent Guidelines Task Force, and Chair of the California Tri-Technical Advisory Committee.

Ann Heil of the Districts will be the lead technical support person for this project. Ms. Heil has worked at the Districts in the Industrial Waste Section for nine years and is currently a Senior Engineer. She has a Bachelor's Degree in Chemical Engineering from the University of Michigan and a Master's Degree in Chemical Engineering from the California Institute of Technology (Caltech). Ms. Heil has run the pollution prevention program for the Districts' Industrial Waste Section for four years and has worked on a number of pollution prevention projects including, most recently, a multi-agency effort to convert solvent-based cleaners to aqueous cleaners while minimizing the negative impact of the conversion on water resources. She has spent four years on the Southern California Pollution Committee, including one year as vice-chair and is a current member of the EPA's Merit Pollution Prevention Partnership.

ATTACHMENTS

- \$ Partnership letter from City of Los Angeles Bureau of Sanitation
- \$ Partnership letter from National Pediculosis Association