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Human Exposure to Mosquito-Control Pesticides — Mississippi, North Carolina, and Virginia, 2002 and 2003

Public health officials weigh the risk for mosquito-borne diseases against the risk for human exposure to pesticides sprayed to control mosquitoes (*1*). Response to outbreaks of mosquito-borne diseases has focused on vector control through habitat reduction and application of pesticides that kill mosquito larvae. However, in certain situations, public health officials control adult mosquito populations by spraying ultra-low volume (ULV) (<3 fluid ounces per acre [oz/acre]) mosquito-control (MC) pesticides, such as naled, permethrin, and d-phenothrin. These ULV applications generate aerosols of fine droplets of pesticides that stay aloft and kill mosquitoes on contact while minimizing the risk for exposure to persons, wildlife, and the environment (*2*). This report summarizes the results of studies in Mississippi, North Carolina, and Virginia that assessed human exposure to ULV naled, permethrin, and d-phenothrin used in emergency, large-scale MC activities. The findings indicated ULV application in MC activities did not result in substantial pesticide exposure to humans; however, public health interventions should focus on the reduction of home and workplace exposure to pesticides.

FIGURE. Ultra-low volume, truck-mounted spraying for mosquito control — Mississippi, 2002

Photo/CDC

Mississippi, 2002

The 2002 West Nile virus (WNV) epidemic in Mississippi prompted an increase in MC activities, including application of ULV permethrin by truck-mounted foggers (Figure). Because of concerns about potential health effects from pesticides, the Mississippi Department of Health and CDC assessed whether MC activities increased individual urine pesticide metabolite concentrations. During September 8–19, 2002, investigators selected a geographically-random sample of 125 persons by using maps of two regions where public health officials applied MC pesticides and 67 persons from

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DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

Unintentional Topical Lindane Ingestions — United States, 1998–2003

Lindane* is an organochlorine pesticide found in certain prescription-only shampoos and topical lotions used to treat pediculosis (i.e., lice infestation) and scabies; lindane has been associated with human neurologic toxicity (*1,2*). In 2004, CDC was alerted to cases of illness caused by unintentional ingestion of lindane by persons mistaking the product for a liquid oral medication (e.g., cough syrup). To assess the extent of illness from ingestion of lindane, CDC, with assistance from the U.S. Environmental Protection Agency, Food and Drug Administration (FDA), and state health departments, collected case reports and analyzed data from the Sentinel Event Notification System for Occupational Risks-Pesticides (SENSOR-Pesticides) program and the Toxic Exposure Surveillance System (TESS). This report summarizes the results of that analysis, which identified 870 cases of unintentional lindane ingestion during 1998–2003, and describes two examples of lindane ingestions. To reduce the risk of lindane ingestion, public health authorities should alert clinicians to the hazards of lindane and the importance of following FDA usage guidelines, which include dispensing lindane in manufacturer-produced, 1- or 2-ounce single-use containers.

Case Reports

Case 1. In November 2004, the Washington State Department of Health reported that a boy aged 3 years ingested approximately 1 teaspoon of 1% lindane shampoo from a previously used 2-ounce bottle. Subsequently, the mother induced vomiting in the boy twice; 1 hour later the boy collapsed and experienced a tonic-clonic seizure lasting 4–5 minutes. After 3 hours, the child was discharged from the emergency department in stable condition.

Case 2. In December 2003, a man aged 47 years in Texas mistakenly ingested 1 ounce of lindane (percentage concentration unknown) from a bottle he believed to be cough syrup. The man vomited; he contacted the poison control center the following morning. He did not seek clinical evaluation.

Surveillance Data

Data were analyzed from pesticide poisoning surveillance systems participating in the SENSOR-Pesticides program† to identify symptomatic cases involving unintentional topical lindane ingestions during 1998–2003. Cases were classified as definite, probable, possible, or suspicious based on the clinical interpretation of signs or symptoms reported by a physician or patient, and evidence of lindane ingestion (*3,4*). Cases were also obtained from TESS§, which is maintained by the American Association of Poison Control Centers; poison information specialists determined which cases had signs and symptoms consistent with lindane exposure. Illness severity was categorized for all cases. Excluded were cases involving ingestion of veterinary and agricultural pesticide products that contained lindane.

During 1998–2003, TESS reported 857 symptomatic cases of unintentional lindane ingestion (Figure); none of the cases were reported as resulting in death. Severity was low in 778 cases (91%), moderate in 71 cases (8%), and high in eight cases (1%) (*4*). Among 823 patients with known ages, median age was 13 years (range: <1–86 years); 53% were female. Signs and symptoms included vomiting (59%), nausea (18%), oral irritation (19%), abdominal cramping (4%), cough (4%), and seizure (3%).

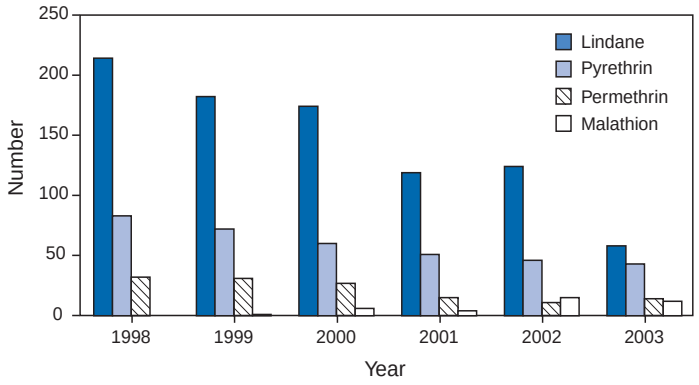
During 1998–2003, SENSOR-Pesticides identified a total of 13 symptomatic cases of unintentional lindane ingestion. Four cases (31%) were classified as definite, two (15%) as probable, six (46%) as possible, and one (8%) as suspicious. Severity was low in eight cases (62%), moderate in three cases (23%), and high in two cases (15%) (*3*). Median age was 7 years (range: <1–58 years), and 69% were male. Signs and symptoms included vomiting (69%), nausea (46%), headache (23%), seizure (23%), abdominal cramping (8%), and confusion (8%). Six (46%) cases in children and four (31%) cases

*Lindane is also referred to as gamma-hexachlorocyclohexane.

†SENSOR-Pesticides is a surveillance program coordinated by the National Institute for Occupational Safety and Health (NIOSH) at CDC and conducted by health departments in nine states. Most participating states collect information on both nonoccupational and occupational pesticide poisonings from various sources (e.g., poison control centers, workers' compensation agencies, or state departments of agriculture). However, priority is given to occupational cases; therefore, the number of nonoccupational poisoning cases is limited.

§TESS receives reports from nearly all poison control centers nationwide.

FIGURE. Number of symptomatic cases from unintentional ingestion of medication for pediculosis and scabies, by medication and year of exposure — Toxic Exposure Surveillance System and the Sentinel Event Notification System for Occupational Risks-Pesticides program, 1998–2003.



in adults were the result of mistaking lindane for cough syrup; two (15%) cases were in unsupervised children who drank lindane, and one (8%) case was the result of pharmacy error (i.e., lindane was recovered from a bottle labeled albuterol).

In addition to lindane, FDA-approved treatments for pediculosis include two over-the-counter medications (pyrethrin/piperonyl butoxide and permethrin) and malathion, a prescription-only therapy. During 1998–2003, TESS identified 523 symptomatic cases of unintentional ingestion of these alternative medications (Figure). Median age was 9 years (range: <1–67 years). Among TESS reports, unintentional lindane ingestions were more likely to produce illness (857 illnesses of 1,463 ingestions [58%]) than unintentional ingestions of each of three other medications, and more likely to produce illness than all three of those medications combined (523 illnesses of 1,691 ingestions [31%]; odds ratio = 3.16, 95% confidence interval = 2.72–3.67).

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Editorial Note: Pediculosis and scabies are common human parasitic infestations. This report indicates that when lindane, a treatment for pediculosis and scabies, is unintentionally ingested, illness can occur, including vomiting and seizures. In 1995, lindane was changed to a second-line therapy for pediculosis because safer alternatives existed (*5*). Lindane also had the slowest pediculicidal and least effective ovicidal activity compared with three other approved pediculicides (i.e., 1% permethrin, 0.3% pyrethrin, and 0.5% malathion) (*6*). In 2003, in light of continued postmarketing surveillance reports of toxicity, FDA revised product labeling guidelines to limit the amount of lindane dispensed to 1- or 2-ounce single-use containers and to require providing patients with a Medication Guide warning of risks from inappropriate use. In addition, FDA issued a Public Health Advisory with these changes (*7*). The new advisory, along with a substantial increase in retail price for lindane, appear to have resulted in a declining number of cases of lindane ingestion (Figure). This decline is similar to the 67% decrease in lindane prescriptions from 1998 to 2003 (*8*).

Before the advisory, bottles of bulk lindane were sometimes repackaged by pharmacies into smaller bottles resembling those used for liquid oral medications (e.g., cough syrup). This resemblance likely contributed to many unintentional ingestions. Subsequent to the advisory, bottles of bulk lindane still in use were not recalled from pharmacies. Therefore, some repackaging might still occur. In addition, consumers might have repackaged lindane in their homes.

In September 2004, the North American Task Force on Lindane drafted an action plan for future use. On January 1, 2005, Canada withdrew registration of lindane for agricultural pest control; Mexico is working on a plan to phase out all uses of lindane. However, with the exception of California, which banned lindane for medicinal use on January 1, 2002, U.S. representatives to the North American Commission for Environmental Cooperation announced that the United States will continue to allow use of lindane as both a pesticide and pharmaceutical (*9*).

The findings in this report are subject to at least three limitations. First, because of the passive surveillance methodology of TESS and SENSOR, the number of reported cases is likely fewer than the number of actual cases. Second, certain eligible cases might have been inadvertently excluded because of erroneous information that suggested exposure to lindane in a veterinary or agricultural product. Finally, although all cases were symptomatic, the possibility of false positives cannot be excluded. Because clinical findings of lindane poisoning are nonspecific and no standard diagnostic test exists, certain illnesses related temporally to lindane exposure might not have been caused by the exposure.

Lindane use in shampoos and lotions for treatment of pediculosis and scabies is declining. However, because of the toxicity of lindane and the potential for illness from unintentional ingestion, health-care providers should be educated regarding appropriate use and packaging. Lindane is a second-line therapy for both scabies and lice and should not be tried unless other treatments have failed or are intolerable; use of lindane also should be avoided for persons weighing less than 110 pounds (50 kg). Because of the risk for toxicity, treatment should not be repeated, even if itching persists; itching can occur, even after successful treatment (especially for scabies) and can be treated symptomatically. In addition, pharmacists should not transfer lindane to other containers and should only dispense lindane in manufacturer-provided 1- or 2-ounce containers. Finally, periodic educational outreach programs can help increase awareness among health-care providers of the new lindane use guidelines.

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Surveillance for Laboratory-Confirmed, Influenza-Associated Hospitalizations — Colorado, 2004–05 Influenza Season

The number of annual hospitalizations for influenza and pneumonia associated with influenza viruses in the United States is estimated at 95,000 (*1*); however, no state-based or national surveillance system exists to monitor these events in all age groups, and population-based numbers of laboratory-confirmed, influenza hospitalizations are unknown. Certain existing surveillance systems provide population-based national estimates of influenza-related hospitalizations based on sampling methodology (i.e., the National Hospital Discharge Survey) or sentinel surveillance; however, these systems are not timely, population-based for all ages, and available at the state level. The Emerging Infections Program (EIP) conducts population-based surveillance for laboratory-confirmed, influenza-related hospitalizations of persons aged <18 years in 11 metropolitan areas, and the New Vaccine Surveillance Network (NVSN) provides population-based estimates of laboratory-confirmed influenza hospitalization rates among children aged <5 years who were prospectively enrolled and tested for influenza in three sentinel counties. The U.S. Department of Health and Human Services recommends that states develop strategies to monitor influenza-related hospitalizations (*2*). This report describes a surveillance system for laboratory-confirmed, influenza-associated hospitalizations in all age groups in Colorado that was implemented for the 2004–05 influenza season. The findings indicate that implementation of statewide, population-based surveillance for influenza-associated hospitalizations is feasible and useful for assessing the age-specific burden of serious influenza-associated morbidity and the relative severity of influenza seasons.

On September 30, 2004, influenza-ssociated hospitalizations became a condition reportable by Colorado health-care providers. An influenza-associated hospitalization was defined for surveillance purposes as a hospital admission accompanied by an appropriate laboratory test result for influenza, including results from rapid diagnostic tests. Population estimates for 2003 (overall 4.6 million) by age group were obtained from the Colorado Department of Local Affairs and used to compute annual age-specific rates of influenza-associated hospitalization. Case reports of influenza-associated hospitalization contained the same core variables that are collected for all reportable diseases in Colorado, including patient identifying, locating, and demographic information; name of reporting agency; physician name and contact information; specimen collection date, specimen type, and test type; test result and date, and report date,

Reporting of notifiable diseases by 68 hospitals in Colorado is performed primarily by infection-control practitioners (ICPs). Many ICPs enter data directly into the state's web-based disease reporting system; however, others fax reports to the Colorado Department of Public Health and Environment (CDPHE) or report directly to local health departments. During the 2004–05 influenza season, ICPs ascertained cases of influenza-associated hospitalization by reviewing clinical laboratory and admission information routinely available to them. ICPs entered 74% of reported influenza-associated hospitalizations directly into the state's reporting system; state or local health department staff members entered the remaining 26%.

Since the 1999–00 influenza season in Colorado, influenza surveillance data have been compiled weekly from multiple sources (e.g., influenza-like illness [ILI] reported by sentinel providers and one health maintenance organization; outbreaks of influenza in nursing homes; absenteeism reported by sentinel schools; and influenza virus typing and subtyping data from state and clinical laboratories) and disseminated via an electronic summary to local health departments. However, none of these influenza surveillance methods are population-based, and none focus on hospitalization.

As of April 16, 2005, a total of 964 influenza-associated hospitalizations had been reported by 50 hospitals, producing a rate of 21.0 per 100,000 persons during the 2004–05 influenza season. Reported cases peaked during the week ending February 19, 2005 (Figure), which was also the peak week for the percentage of patient visits for ILI reported by sentinel health-care providers in Colorado (CDPHE, unpublished data, 2005). Influenza virus type–specific testing results were available for 896 (92.9%) reported cases, of which 86.3% were influenza A and 13.7% were influenza B. The most frequently