Life after Lindane in California
Water Concentrations, Poison Control Calls
Drop Following Ban

Lindane, a persistent, highly toxic, and bioaccumulative organochlorine insecticide, was used in agriculture and as a topical treatment for human head lice and scabies beginning in the 1940s. As its toxicity became better known, manufacture and use declined in the United States; in 2002, California banned the pharmaceutical use of lindane altogether. According to a new study, that ban appears to have resulted in steep drops in concentrations of lindane in Southern California’s wastewater and a dramatic reduction in calls to the California Poison Control System \([\text{EHP} 116:297–302; \text{Humphreys et al.}]\).

The most common adverse effects of lindane exposure in humans include seizures, dizziness, and headaches. High levels of exposure can be fatal. Although the U.S. Environmental Protection Agency has canceled all registrations for lindane-containing compounds in agriculture, the chemical is still available by prescription as a second-line treatment for head lice in states other than California. Its continued pharmaceutical use raises concerns about its potential presence in wastewater effluent and drinking water.

The research team, part of the University of California, San Francisco, Pediatric Environmental Health Specialty Unit, examined historical lindane concentrations in several Southern California water pollution control plants and compared them before and after the ban. To assess the ban’s impact on human exposures, they analyzed lindane-related calls to California’s poison control hotline between 1998 and 2006. They searched the Medical Fee-for-service pharmacy-paid claims database and obtained national data from Verispan, a commercial health industry data tracker, to determine the number of lindane prescriptions issued. The team also conducted a random survey of pediatricians to ascertain both their awareness of the ban and their current treatment preferences for scabies and head lice.

In Los Angeles County, the average wastewater concentration of lindane in 1999 was 36 ppt. By 2006, concentrations had dropped to almost undetectable levels throughout California. In 1998, 135 per 100,000 calls to the Poison Control System concerned lindane; by 2006 such calls had declined to 2 per 100,000. Similarly, lindane prescriptions fell from 114,000 in 1997 to 34 in 2002. Medical providers reported few problems using alternative treatments such as pyrethrins.

The study authors are encouraged by their findings but note that lindane is still used in many countries, mostly in the developing world, and that every ton of lindane manufactured produces about 9 tons of toxic waste. Although the U.S. Food and Drug Administration has not banned pharmaceutical lindane in the United States, the pesticide is currently under review for inclusion in the Stockholm Convention on Persistent Organic Pollutants, which could eventually lead to a worldwide ban. \(--\text{Valerie J. Brown}\)

Dust Storm Fallout
Tiniest Travelers Pose Greatest Infection Threat

Dust isn’t just a nuisance—it’s ability to clog human airways and carry pathogens poses a human health problem. In the sub-Saharan region of Africa, the World Health Organization pinpointed dust storms exacerbated by the dry season and drought as a cause of outbreaks of meningococcal meningitis. Dust from Saharan storms can reach as far away as Florida, with particles smaller than 2.5 µm traveling the greatest distances. Studies have shown that human exposure to these tiny particles is associated with human mortality, and new research now shows that such particles are also more likely to carry health-threatening bacteria \([\text{EHP} 116:292–296; \text{Polymenakou et al.}]\).

During a strong Saharan dust storm in 2006, researchers collected air samples in Heraklion, Crete, an area that often feels the effects of such storms. Particles from the samples were separated according to size (>7.9 µm, 3.3–7.9 µm, 1.6–3.3 µm, 1.0–1.6 µm, 0.55–1.0 µm, or <0.55 µm) using a machine called a high-volume cascade impacter. The researchers characterized the bacteria traveling on particles of various sizes by taking samples from the machine’s filters, then cloning and sequencing a strand of DNA commonly used to identify bacteria. This process created an inventory of the bacterial gene sequences present in each of the six particle-size ranges. The creation of large clone libraries allows investigators to detect bacteria that are missed using culture methods, as some bacteria are difficult to grow.

The researchers identified clones that were genetically related to pathogens linked to human diseases such as pneumonia, meningitis, and bacteremia, or to pathogens suspected of inducing infections such as endocarditis. Of the sequenced clones related to bacteria that are dangerous to humans, almost half (43%) were found at particle sizes less than 3.3 µm. Spore-forming bacteria such as \textit{Firmicutes} dominated the particle sizes larger than 3.3 µm. Most of these bacteria are nonpathogenic.

The authors conclude that the prevalence of breathable bacteria on small dust particles may pose a significant, widespread health risk to humans, given that dust, especially the smallest particles, is known to travel across continents. To determine just how much of a threat these tiny travelers pose, long-term studies are needed to further investigate how pathogens are distributed across dust particle size, and the distances these pathogens can travel and still survive.

\(--\text{Angela Spivey}\)
Taking a Bite Out of Amalgam Concerns?
Study Shows No Renal Effects in Children

Dental amalgam is a major source of human exposure to inorganic mercury, which is thought to occur primarily when elemental mercury from the amalgam surface evaporates and is inhaled. Prior studies provide strong evidence that the central nervous system and the kidney are the primary targets of inorganic mercury. Data from the New England Children’s Amalgam Trial (NECAT), a clinical trial designed to study the possible health effects in children of mercury-containing dental amalgam, now indicate that amalgam fillings’ effects on renal function may be quite small [EHP 116:394–399; Barregard et al.].

The study, launched in 1996 in Maine and Massachusetts, is one of two parallel randomized trials funded by the National Institute of Dental and Craniofacial Research. These trials provide the first rigorously designed clinical data on the effects of children’s dental exposure to mercury, a known neuro- and nephrotoxicant.

A group of 537 children aged 6–10 years at the start of the trial were followed for five years. Children began the trial with no pre-existing fillings and at least one cavity in a back tooth. The children were randomly assigned to two groups, one receiving only amalgam fillings in cavities in the back teeth and the other receiving only composite fillings in the back teeth. Both groups received the more aesthetically pleasing composite fillings in the front teeth, conforming to current standard dental practice.

The children showed no statistically significant differences in several markers of toxicity to renal tubules studied—including N-acetyl-β-D-glucosaminidase and alpha-1-microglobulin, both early indicators of toxic exposure to mercury vapor, or in γ-glutamyl transpeptidase, which has been shown to be affected by toxic heavy metal exposure—regardless of whether their cavities were filled with amalgam or with composite.

Microalbuminuria, the occurrence of small quantities of albumin in the urine, increased in 10 children treated with amalgam and in 2 treated with composite fillings, but it did not correlate with the number of amalgam fillings or with increasing concentrations of mercury excreted in urine.

Because this difference is marginally significant, the authors note it may be due to chance. Moreover, microalbuminuria can occur transiently as a consequence of recent vigorous play. The results therefore appear to indicate that the use of amalgam fillings does not cause any clear, consistent damage to kidney function in young, developing children. –Victoria McGovern

Prenatal Lead Exposure in Mice
Age-Related, Sex-Specific Effects Observed

Children with low-level prenatal lead exposure may suffer reduced cognitive function, impaired motor ability, and visual and auditory processing problems. Other effects, such as accelerated age-related functional decline or delayed neurotoxicity, may become apparent in adulthood, though few studies have examined the long-term consequences of exposure. A novel animal model now reveals age-related, male-specific, and nonmonotonic dose–response effects associated with low-level prenatal lead exposure [EHP 116:355–361; Leasure et al.].

To model gestational lead exposure (GLE), one group of dams received tap water or drinking solutions containing low (27 ppm), moderate (55 ppm), or high (109 ppm) concentrations of lead beginning 2 weeks before mating and continuing until postnatal day 10. To measure postnatal lead exposure (PLE), another group of dams received tap water or water that contained low or moderate levels of lead from birth to weaning. The offspring of both groups were measured at birth and several times throughout the following year for weight and blood lead concentrations.

Blood lead levels ranged from 10 µg/dL or less in low-exposure GLE offspring to 42 µg/dL in the high-exposure GLE group at postnatal day 10, and from 10 µg/dL in low-exposure PLE offspring to 27 µg/dL in the high-exposure PLE group at postnatal day 21. By postnatal day 30 for GLE offspring and postnatal day 60 for PLE offspring, blood lead levels were no different than in controls.