References

1. J. Bergelson, C. B. Purrington, G. Wichmann, *Nature* **395**, 25 (1998); K. M. Nielsen, A. Bones, K. Smalla, J. D. van Elsas, *FEMS Microbiol. Rev.* **22**, 79 (1998).
2. S. Wright, *Molecular Politics* (Univ. of Chicago Press, Chicago, 1994).
3. *Cloning Human Beings: Report and Recommendations of the National Bioethics Advisory Commission* (National Bioethics Advisory Commission, Rockville, MD, 1997).
4. L. M. Silver, *Remaking Eden* (Avon, New York, 1997).

Lead Regulation

In "The paradox of lead poisoning prevention" (Policy Forum, *Science*'s Compass, 11 Sept., p. 1617), Bruce P. Lanphear states that primary prevention should be the national approach for addressing the problem of childhood lead poisoning. I could not agree more. Because some of the health effects associated with lead exposure in young children are irreversible, our children should not be used as devices to test for the presence of lead hazards. I disagree, however, with Lanphear's assertion that the federal government's efforts are focused on "screening children for elevated blood lead levels and controlling lead hazards after a child has been unduly exposed." The Environmental Protection Agency (EPA) has long emphasized primary prevention, beginning with the phaseout of lead in gasoline (*1*) and including many other efforts to get the lead out of air and drinking water (*2*). Currently, EPA works closely with the Centers for Disease Control and Prevention (CDC) and the Department of Housing and Urban Development (HUD) on primary prevention efforts to get lead out of housing. The following are some concrete measures that have been taken.

EPA and HUD have issued final regulations requiring property owners to disclose the presence of lead-based paint or lead-based paint hazards before the lease or sale of most pre-1978 housing (the year the sale of residential lead paint was banned); prospective buyers also have a 10-day opportunity to evaluate the property for the presence of lead-based paint or lead-based paint hazards (*3*);

EPA has provided an extensive amount of public education to property owners and parents, giving them the information they need to protect young children from lead exposure (for example, *4*).

EPA has issued mandatory requirements for the training and certification of individuals and firms that do lead work so that we can avoid the hazards cited by Lanphear (*5*).

EPA has issued requirements for renovation contractors to provide information to occupants before the start of a project so that work can be done in a way that prevents exposure to children and workers (*6*).

EPA and HUD have spent millions of dollars on research to develop safe, effective, and affordable abatement methods and products (for example, *7*).

HUD has provided almost $400 million in grants to evaluate and control hazards in high risk communities (*8*), and HUD and CDC have jointly funded primary prevention projects to develop community-based approaches to the elimination of childhood lead poisoning.

To support implementation of the national lead-based paint hazard reduction program, EPA is developing residential hazard standards for lead in paint, dust, and soil. The proposed standards, which were published for public comment on 3 June 1998 (*9*), are designed to be used prospectively. That is, they should be used to identify hazards before children are exposed and injured. In addition to obtaining public comment, EPA also presented its technical supporting analysis to the agency's independent Science Advisory Board (SAB) and is currently awaiting the results of the deliberations. The science base for developing lead, soil, and dust standards is complex. The EPA is committed to a set of final standards that we can be confident will

help protect children because they are based on the best scientific information. Lanphear's concerns, along with comments of others and the SAB review, will be considered in developing a final set of standards.

EPA shares Lanphear's goal of eliminating subclinical lead toxicity by identifying and controlling residential lead hazards. I too believe that this is a goal that is within our grasp.

Lynn R. Goldman
Assistant Administrator, Office of Prevention, Pesticides and Toxic Substances, U.S. Environmental Protection Agency, Washington, DC, 20460, USA

References and Notes

1. **40** *Code Fed. Reg.*, part 80.
2. *ibid.*, parts 141 and 142.
3. *ibid.*, part 745, subpart F; **24** *ibid.*, subpart H.
4. National Lead Information Clearinghouse, 1-800-424-LEAD; *Lead in Your Home: A Parent's Reference Guide* (EPA 747-B-98-002, Environmental Protection Agency, Washington, DC, June 1998); EPA's lead Web site, www.epa.gov/lead.
5. **40** *Code Fed. Reg.* part 745, subpart L.
6. *ibid.*, subpart E.
7. *Lead-Based Paint Abatement and Repair and Maintenance Study in Baltimore: Findings Based on Two Years of Follow-Up* (EPA 747-R-97-005, Environmental Protection Agency, Washington, DC, December 1997); *Laboratory Study of Lead-Cleaning Efficacy* (EPA 747-R-97-002, Environmental Protection Agency, Washington, DC, March 1997).
8. HUD's Web site, http://www.hud.gov/lea/leagrant.html.
9. *Fed. Regist.* **63**, 30302 (3 June 1998).

Response

I applaud EPA's efforts to educate the public, certify inspectors, mandate disclosure, and require contractors to warn customers about potential lead hazards. But while these efforts are necessary, they are insufficient to prevent childhood lead poisoning. Indeed, the benefit of each of these efforts depends heavily on the ability of the standards to identify and control lead hazards, including lead-contaminated house dust, soil, and water (as I stated in my Policy Forum).

Goldman argues that "EPA has long emphasized primary prevention of lead poisoning." EPA defined lead as a pollutant only after the National Resource Defense Council brought a suit against the agency in 1973. Moreover, the phase-out of leaded gasoline was not to protect human health. "It is ironic," Sergio Piomelli, a lead-poisoning expert at Columbia University wrote, "that the removal of lead from gasoline was decreed to protect not the children, but the automobile's catalytic converter" (*1*). Ultimately, of course, EPA did promulgate regulations to eliminate leaded gasoline, but it was, not unlike the proposed rule for residential lead hazards, an uphill battle.

Goldman states that EPA's water-lead standard exemplifies the agency's emphasis on primary prevention. The EPA standard for lead in water was based on remarkably insufficient data. Yet the agency has not verified that the standard protects the general population—especially pregnant women and children, who are particularly vulnerable to lead-contaminated water. Indeed, recent data suggest that EPA's water-lead standard may not adequately protect children (*2*). Finally, the water-lead standard—like the proposed residential lead standards—is voluntary and not enforceable. The level of enforcement will dictate the extent of testing and effect of any regulations to control lead hazards.

Goldman writes that "EPA and HUD have spent millions of dollars on research to develop safe, effective, and affordable abatement methods and products." Unfortunately, the safety and benefit of residential lead hazard controls remain uncertain for children with blood lead levels of less than 25 grams per deciliter.

Goldman points out that EPA has presented its technical analysis for residential standards to the agency's independent SAB. While there are a number of eminent scientists on the SAB who reviewed the lead standard, there were not any whose specific expertise is environmental lead

exposure for children.

Finally, Goldman states that "EPA is committed to a set of final standards that we can be confident will help protect children because they are based on the best scientific information." Still, neither Goldman's letter nor the proposed rule presents the scientific data to support this assertion. Indeed, the scientific data were hopelessly entangled with uncertainties about economic benefits and feasibility to achieve the standards. As a result, the proposed rule was incomprehensible. The EPA's SAB stated it more politely: "[T]he complexity presented in the Agency report was difficult to follow." Moreover, some data in the proposed rule were misrepresented, while other relevant data were not included.

It is unlikely that EPA will promulgate standards that protect the majority of children who are at risk for lead poisoning. Nor does it appear that the agency recognizes some of the fundamental problems with their current strategy to prevent lead poisoning. Unfortunately, it does appear that biased economic analyses rather than rigorous scientific evidence will continue to dictate EPA's policy to prevent childhood lead poisoning.

Bruce P. Lanphear
Children's Hospital Medical Center, and Department of Pediatrics, University of Cincinnati, Cincinnati, OH 45229–3039, USA. E-mail: bruce.lanphear@chmcc.org

References

1. S. Piomelli, *Pediatrics* **93**, 508 (1994).
2. B. P. Lanphear *et al.*, *Environ. Res.* **76**, 120 (1998).

CORRECTIONS AND CLARIFICATIONS

In the 20 November issue, the photograph on the left on page 1448 was printed incorrectly. The correct image is shown below.

In the 13 November NetWatch "Backward twist" (p. 1223) and in the correction concerning this item in the issue of 27 November (p. 1646), the URL for the Left Handed DNA Hall of Fame should have been given as "www-lecb.ncifcrf.gov/~toms/LeftHanded.DNA.html."

In table 1 (p. 1128) of the report "Chromosome 2 sequence of the human malaria parasite *Plasmodium falciparum*" by M. J. Gardner *et al.* (6 Nov., p. 1126), "945" in the first row under "*P. f.* chr. 2" should have been "947." The Web address listed in the caption for table 2 (p. 1129) should have been "www.tigr.org/tdb/mdb/pfdb/pfdb.html." In the description of this report in This Week in Science (p. 1005), "945" should have been "947," and "209" should have been "210."

In reference 24 (p. 1147) of the report "Embryonic stem cell lines derived from human blastocysts" by J. A. Thomson *et al.* (6 Nov., p. 1145), M. G. Klug's name was spelled incorrectly.

The e-mail address for Henry T. Greely, whose editorial "Genomics research and human subjects" appeared in the issue of 23 Oct. (p. 625), was incorrect. The correct address is hgreely@leland.Stanford.edu.

The e-mail address for Peter D. Saundry, author of the letter "Environmental decision-making" (16 Oct., p. 415) was incorrect. It should have been peter@cnie.org.