major concern, and efforts to curtail Pb consumption should be rigorously investigated.

One source that certainly contributes to this widespread problem is permanently installed drinking water fountains (3); of notable concern are water fountains found in elementary schools (1,2,4). Many old school buildings probably contain Pb-contaminated supply pipes or Pb solder from which the Pb leaches into drinking water and is then passed into human tissues, causing various physiological and neurological damage. As water in these buildings rests in Pb-contaminated plumbing overnight, throughout the summer months, and during school vacations when there is little movement of water, Pb accumulates and levels increase, causing a potential health threat. However, leaching of Pb is unpredictable, and strategies for the elimination of it from drinking water have been difficult to develop and evaluate. Although various approaches have been devised to reduce Pb in water to safe levels, i.e., adding calcium carbonate and legislating stringent Pb piping standards, these endeavors are not sufficient for complete safety (3). Temporary efforts to reduce Pb concentration in drinking water include morning flushing of the water source or permanently installed water coolers (J), use of Pb filters, or switching to bottled water dispensed in free-standing coolers. It has been reported that one-time morning flushing of drinking water coolers in elementary schools may not provide day-long Pb exposure protection for children (4). Flushing is tedious and time consuming and offers only temporary reduction of Pb because, in many cases, the Pb leaches back into the water from Pb-contaminated plumbing; therefore, many people have switched to bottled water dispensed in free-standing coolers. Until recently, it was not known whether chemical contaminants such as Pb would accumulate in bottled water dispensed in free-standing coolers.

We have examined bottled water dispensed from free-standing coolers and found Pb levels to be less than 5 ppb without any evidence of Pb accumulation in water remaining in contact with the plastic plumbing materials and the stainless steel water reservoir cooling tank during periods of non-use up to 28 days (unpublished observations). These free-standing water coolers with plastic plumbing and a stainless steel water tank may be one way to provide school children with Pb-free drinking water.

**Bill Jirles**
**Julius Thigpen**
**Diane Forsythe**
National Institute of Environmental Health Sciences
Research Triangle Park, North Carolina

**REFERENCES**

1. Mass RP, Patch SC, Gagnon AM. The dynamics of lead in drinking water in U.S. workplaces and schools. Am Ind Hygiene Assoc J 55: 829–832 (1994).
2. Gnaedinger RH. Lead in school drinking water. J Environ Health 55(6):15–18 (1993).
3. Davis WF. A case study of lead in drinking water: protocol, methods, and investigative techniques. Am Ind Hyg Assoc J 51:620–624 (1990).
4. Murphy EA. Effectiveness of flushing on reducing lead and copper levels in school drinking water. Environ Health Perspect 101:240–241 (1993).

**Calculation of Cancer Risk**

Recently the EPA proposed changes in how it determines which chemicals and pollutants cause cancers, relying less on animal tests and more on new techniques of molecular biology. Acknowledging recent advances in molecular biology and other fields, EPA's new proposal would give more weight to a broad range of evidence, including details about precisely how toxic agents wreak their harm on human cells and on genetic material that control cells' reproduction. By taking the mechanics of cancer into account, the new approach will more precisely measure a chemical's cancer potential. At the same time, the new proposal opens the way for new statistical analyses about the effects that chemicals might have at very small doses that people are exposed to, rather than at very large doses given to animals to test their effects.

In summary, the EPA will rightly draw more on improved understanding of the mechanism by which toxic effects are produced. Over the years it has been recognized that the ultimate value of toxicological information relates to its use in the development of formal risk or safety assessments. Thus, a broad array of research is focused on the development of mechanistic information that will have value in assessing the potential human health risk of environmental pollutants and consumer products and assessing the safety of pharmaceuticals.

From this research has emerged significant advances in our understanding of the mechanism of carcinogenesis, which justifies EPA's effort to rethink cancer calculations. Among these advances are the following:

- Significant developments in science of how humans metabolize cancer-causing substances. Most molecules identified as carcinogenic do not produce their detrimental effects themselves. They have to be metabolized, usually into a form that can react irreversibly with sites on DNA, altering gene expression. The role of two important sets of enzymes—the