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The Water Guy

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Description

This article by Pierre Home-Douglas is taken from the American Society for Engineering Education's PRISM Magazine. Vol 14, Num 3., November 2004. It describes the efforts of Marc Edwards to fight toxic lead levels in the water supply in Washington, DC.

Body

FIRST, MARC EDWARDS DISCOVERED HIGH LEVELS OF LEAD IN WASHINGTON, D.C.'S, DRINKING WATER, THEN HE HAD TO PERSUADE THE BUREAUCRACY TO GET THE WORD OUT.

It was a problem that had baffled civil engineer Marc Edwards for a decade. By the time the Virginia Tech professor finally figured out the answer, he had stumbled across a health issue that ended up pitting him against the Environmental Protection Agency (EPA) and the utility that supplies Washington, D.C., with its drinking water. The resulting battle and stress affected his health, but Edwards persevered and was finally vindicated, assisted by three graduate students he credits with helping him through the ordeal.

Edwards is one of the world's leading experts in water corrosion in home plumbing. In the mid-90s he started getting calls from homeowners across America who had problems with pinhole leaks in their home plumbing systems. Edwards points out that plumbing may sound like a trivial asset in the grand scheme of things, but the value of pipes in all the buildings in America adds up to more than a trillion dollars.

One pinhole leak in a home isn't so bad, Edwards says, but once you have two, plumbers and insurers usually recommend replacing the plumbing, figuring that other leaks are bound to happen. That's typically a $2,000 to $6,000 investment. If those leaks cause mold problems inside the walls, the home's resale value could plummet. The problem was, Edwards discovered, that no one wanted to take responsibility for the problem. "Homeowners were basically left to fend for themselves," he says. "The historical mentality of the water industry is that its problem ends at the street. Anything that happens beyond that, it'll help—but only to a certain extent, arguing that water may not be the cause. Some of the homeowners I dealt with literally lost their homes."

What baffled Edwards about the leaks was that they were occurring in copper pipes, which have been used for more than a century and typically last for 50 years. Some of the pipes he examined had developed leaks only 18 months after being installed. In one house the tube had a leak every inch. "It was like a sprinkler hose," Edwards recalls. The problems were often passed off as shoddy plumbing work, a rare batch of poor copper, or even lightning strikes and stray currents. Edwards thought otherwise. "I figured something must have changed in the water."

Flash forward to March 2003. A group of homeowners in Washington, D.C., had called Edwards in to find out what was eating up their copper pipe. He had heard that there were occasional problems with lead in the District's water, so he decided to sample for lead at the same time. The normally accepted limit of lead in drinking water is 15 parts per billion (ppb). Edwards's meter could register results as high as 140 ppb. The water he tested went right off the scale. Edwards diluted the sample to 10 percent of its original strength, and it was still off the scale, indicating that the levels were in the thousands of parts per billion. "Some of it would literally have to be classified as a hazardous waste," he says.

He was flabbergasted. "First off, I didn't believe my meter. But in the unlikely event that lead values were that high there was a serious problem that needed to be dealt with aggressively." Edwards immediately enlisted the help of graduate students and

started taking samples at other District homes. Lacking conclusive proof and not wanting to raise an alarm unnecessarily, he didn't publicize his work. He continued experiments that, ultimately, unearthed another dimension to the problem.

In the past, the District of Columbia Water and Sewer Authority (WASA) had advised its customers to let water run from the tap for 30 seconds to 1 minute to flush all the lead out. Edwards's sampling, however, indicated that the lead levels were actually highest in water coming between 30 seconds and a few minutes. "The water utility and the EPA were inadvertently causing some people to drink the very worst water possible," Edwards says.

EPA had subcontracted with Edwards to identify the problem with lead in the water, and WASA had solicited a proposal for urgent research. And yet when Edwards's sampling program proved there was a problem with the advice given to consumers, WASA did not issue any new instructions. "For me it was a basic moral question," Edwards declares. "If you were at all concerned about the health of the people you served, it was imperative to alert them the instant you discovered the problem and knew your well-intentioned advice was wrong."

Then the results from his sampling program stopped coming from the utility. On January 2 WASA called Edwards with an ultimatum: either stop working for the homeowners and work only for the utility, or be cut off from future monitoring data. "In other words, I was either with them or against them," Edwards says. The utility also said it would give the $110,000 of work Edwards had proposed to another researcher. Up to this point, Edwards had been paying for the full-time student research out of his own pocket. "There was no way I could compromise my integrity with the consumers for research funding, no matter how badly I needed the money." Edwards flatly refused WASA's demand.

EPA had another surprise. It suddenly discontinued its own subcontract with him. "That's when I suspected that WASA and EPA had both made mistakes and were in the same boat," Edwards recalls. "EPA's action stunned me. I mistakenly believed its job was to protect public welfare and enforce the law above all else, and instead EPA cut me out of my ongoing work on behalf of consumers." Edwards was so concerned about the lack of clear public warning to homeowners and the newly discovered dangers, he spent sleepless weeks worrying about the situation. A marathon runner, he lost 35 pounds in three weeks. He eventually checked into the emergency room of a hospital with heart problems.

Finding the Culprit

Then the Washington Post got hold of the story. In January 2004 the paper ran the first of a dozen front-page articles about the problem. "When that first article hit, people went berserk," Edwards recalls. The trouble was, the paper did not correct the flawed advice about flushing the lead out. In fact, the articles consistently repeated WASA's advice as a means to protect the consumer from lead exposure.

The publicity alerted politicians to the problem. Congresswoman Eleanor Holmes Norton (D-DC) pushed for a congressional hearing. Edwards testified in March, and Norton says he was "very, very credible on the excess amount of lead in D.C. water." "That credibility," she adds, "was enhanced by his reasonability. Some of the public health people took the position that the only safe amount of lead in the water was zero. He was not willing to say that, so he wasn't seen as someone who wanted to make it impossible for people to deliver water in the first place."

At the hearing, Edwards finally identified the culprit that had caused the lead leaching: chloramine. Made from chlorine and ammonia, the chemical had replaced chlorine as the disinfectant for drinking water in Washington, D.C., starting in March 2000. "I had read papers on the effect of chloramines on lead, and found that 50 years ago people noted some serious corrosion issues for brass, an alloy of copper, lead, and zinc," Edwards says. He adds that chloramine leachs lead not only out of lead pipes but even from so-called lead-free brass (which actually contains 8 percent lead) and lead-containing solder used to join copper tubes before it was banned in 1986.

The EPA and WASA were reluctant to accept this hypothesis until the water utility switched back to using chlorine for a regular cleanup of its pipes in April. The lead levels immediately dropped. When it switched back to using chloramine in May, the levels rose dramatically. Finally, in June 2004, the EPA ruled that WASA had violated federal law by not properly notifying the public about unsafe levels of lead in the water. "The wheels of justice turn slowly," Edwards says, "but they do turn."

That didn't mean a switch back to chlorine, however. As Edwards points out, when the EPA drew up its rules for water contamination in the '90s, it largely considered concerns about lead contamination an issue of the past, and inadvertently placed it much lower on the scale of health worries than substances called

organochlorides—suspected carcinogens caused as a byproduct of chlorination. The new EPA regulations pressured some utilities to switch to chloramine. Ironically, as Edwards points out, "The net result is that in D.C., we are exchanging a few parts per billion of a suspected carcinogen (organochlorides) for hundreds or even thousands parts per billion of lead—a known public-health threat, linked to birth defects and mental retardation." To counteract the corrosion problem, WASA has decided to include orthophosphate in its water treatment.

The whole experience has taught Edwards not only about the frustration of fighting bureaucracy but also something about the quality of today's engineering students. "You hear about the fact that North American students are so far behind their peers in some other countries, they don't have the same work ethic and they don't know this and they don't know that, but I will tell you that it almost brings tears to my eyes to think about the hours they invested and their commitment. It was really remarkable. You can't tell me that students of any era would have performed any better."

"At times," he adds, "I wanted to give up because I didn't have money and I was paying them piecemeal out of my own pocket, but they were so enthusiastic about working on something that would help consumers — something that was also new scientifically — I didn't have the heart to tell them we had to stop."

Edwards grew up near Buffalo, where he completed an undergraduate degree in biophysics at SUNY Buffalo. He then went to graduate school — in engineering. "I visited all kinds of programs and I had the best feel for the people in environmental engineering. I thought that this is an area where you can solve real problems that impact people's everyday lives." He completed a Ph.D. at the University of Washington in Seattle. Since then, he has worked as a consultant on corrosion problems with water authorities around the world, from Chile to Australia, from Korea to Germany. He joined Virginia Tech's department of civil and environmental engineering in 1997. Today, the 40-year-old teaches courses in water treatment. "The students are the best part of the job," he says. "It's great to work with young people who feel a deep sense of commitment, who are willing to sacrifice their time and effort to advance scientific understanding on behalf of the public." Edwards also serves as president of the Association of Environmental Engineering and Science Professors, which he says was very supportive during his battle with WASA and the EPA.

Edwards, his wife, and two pre-school children live in Blacksburg, Va., where he indulges his passion of growing exotic fruit and nut trees like pawpaws, kiwis, and persimmon. "Why I do it, I don't really know," he says with a chuckle. He finds the hobby fascinating even though he admits that it takes many years to see results. "Actually, it's a lot like research. You have to invest the years before you see the fruits of your labor. Some of the trees I planted take 10 years before there is even a hope of seeing results. He pauses for a couple of seconds. "Oddly, it took about the same time before we made any significant progress in understanding the problem of pinhole leaks in home plumbing."

Notes

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