In Bangladesh, arsenic-free water set to flow from cheap new filter

Sacks of coal ash, a widely available waste product, promise to make arsenic-contaminated water safe to drink and provide relief to millions in South Asia.

A new filter dubbed ARUBA—for Arsenic Removal Using Bottom Ash—uses fine ash particles from coal-burning power plants in India. Coating the microscopic ash particles with a thin layer of ferric hydroxide and exposing them to air changes the fine gray dust into a rust-colored powder that traps arsenic on its surface.

For nearly 30 years, villagers in Bangladesh and the neighboring Indian state of West Bengal have been drinking water laced with toxic levels of arsenic. Naturally present in the region's groundwater, the arsenic is pumped to the surface by tube-wells originally intended to provide a safe alternative to lakes and streams contaminated with bacteria. More than 4 million tube-wells provide the primary source of drinking water in the region, and an estimated 20% of those harbor unsafe levels of arsenic.

But residents there have few alternatives. "It's horrible to be forced to drink water that you know is going to kill you and have no choice," says Ashok Gadgil, senior staff scientist at Lawrence Berkeley National Laboratory, who developed ARUBA.

The problem has inspired myriad solutions to trap the arsenic: from a primitive sand filter with a layer of rusty nails to activated aluminum or synthetic membranes. Several approved filters use adsorption and ion exchange to remove the arsenic. But most rely on imported materials, rendering them expensive, some are difficult to use or maintain and none work reliably for all water conditions. Gadgil estimates an initial cost of under $10 for ARUBA, and an annual maintenance cost of $2 per person to replace and dispose of the used filters.

Reuters/Rafiqur Rahman

Not a drop to drink: The water in many parts of Bangladesh is laced with toxic levels of arsenic.

What's more, Indian coal ash is comprised mostly of silica, which is both sterile and nontoxic. But the most important factor, Gadgil says, is the small size of the ash particles—less than one tenth the diameter of a human hair—and their smooth glass-like surface, which optimizes the filter's ability to snare arsenic.

But ARUBA has several hurdles to clear. For instance, there are significant differences in the water quality across the country or even in neighboring wells. Factors such as pH or variations in the concentrations of arsenic, iron or phosphate can dramatically alter a filter's performance. High iron or phosphate can quickly clog filters.

Improper use and maintenance can also cripple the technology, adds Jan-Willem Rosenboom, a consultant for the World Bank. "What we find time and again in Bangladesh and other countries is that where a technology does not work, this is hardly ever the result of the technology," he says.

For instance, filters may need to be periodically changed or flushed out with chemicals to restore their effectiveness—and most users are not trained to do this. Pump valves could also jam or become choked with sand (*Environ. Sci. Technol.* **39**, 4300–4306; 2005).

In the lab, ARUBA has been shown to reduce arsenic concentrations of 2,400 parts per billion (p.p.b.), more than twice the highest levels found in Bangladesh, to below the World Health Organization guideline of 10 p.p.b. and five times lower then the Bangladeshi standard of 50 p.p.b. Only 2 of 18 arsenic removal plants have consistently met the 50 p.p.b. standard, and none have met the World Health Organization guideline (*Nature* **436**, 313; 2005). Coupled with a straightforward design that is tailored to fit the local user, says Gadgil, ARUBA might succeed where others have failed.

Gretchen Cuda, San Francisco

Lack of leadership once again plagues US drug agency

Following the abrupt, unexplained resignation of the chief of the US Food and Drug Administration (FDA), observers are concerned that the crisis-ridden agency is being thrust into yet another prolonged period without permanent leadership.

Despite the quick appointment of an interim commissioner—Andrew von Eschenbach, chief of the US National Cancer Institute (NCI)—the $1.9 billion FDA could find itself adrift indefinitely while the White House remains preoccupied with disasters, wars and gas prices, they say.

"The agency really does need to have permanent leadership in this time of great turmoil," says Geoffery Porges, a former Merck executive and New York–based pharmaceutical analyst.

The FDA, which regulates roughly one-quarter of the US consumer economy, has been without a confirmed commissioner for more than three of President Bush's nearly five years in office. During that period, the agency has had to weather some particularly rocky times, including controversies about the side effects of antidepressants and painkillers and manufacturing deficiencies in flu vaccines.

Finding a permanent new commissioner could take months or even years. Mark McClellan, the first Bush appointee, didn't take charge of the agency until November 2002—two years after Bush was elected. After McClellan left in March 2004, interim commissioner Lester Crawford was not confirmed for 16 months.

"Unless the [Bush] administration makes filling this critical position a priority, there may not be a commissioner for who knows how long," says William Schultz, the FDA's deputy commissioner for policy in the 1990s.

Initial speculation that von Eschenbach might become permanent commissioner was quashed in early October by Michael Leavitt, the Health and Human Services Secretary. "Andy is acting commissioner, and I suspect that will be his status until we fill it permanently," Leavitt said.

Crawford's resignation on 23 September, just two months after his Senate approval, took Washington by surprise. Within hours, the White House announced that von Eschenbach, a Bush family friend (*Nat. Med.* 8, 7; 2002), would take over as interim commissioner—but remain at the helm of the NCI.

After critics protested that the dual role could constitute a conflict of interest, von Eschenbach said he would step down from his daily duties at the NCI and recuse himself from most NCI-related matters, such as drug and device approvals, at the FDA.

In the meantime, observers continue to speculate on the reasons for Crawford's resignation. One persistent report suggests that he failed to adequately disclose his financial interests to the Senate. Six days after his resignation, the committee that oversees the FDA launched an investigation into the circumstances surrounding his departure.

Meredith Wadman, Washington, DC