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Worms Clean Toxic Metals From Indian Soil

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Worms, those squishy animals sought after by fishermen for bait and early birds for nutrition, have not got a new occupation -- treating thousands of tons of toxic sludge left in farms and fields by Indian factories as industrial growth skyrocketed in recent years.

The key to success has been that the worms burrow up to five feet deep into the contaminated soil, soak up heavy metals and other toxins, and then come to the surface without releasing the toxins.

The worms then are allowed to wander off into nearby land, dispersing and diluting the toxins so they no longer pose a threat to people or the environment. Otherwise, the worms may be transported to a secure, long term dump site or burned in an incinerator.

Already a pilot project has shown a drastic reduction in toxicity after the worms, bought for $20 per kilogram from a commercial grower about 100 miles from the toxic site, were spread over polluted earth near the industrial city of Ahmedabad.

Project scientists say the Indian government has ordered a study of contaminated sites that could be treated by similar methods. Already a proposal has been issued for funding to clean a second site 500 yards from the first pilot project.

Soil samples of the treated areas show that the worms removed more than 60% of the toxins in the 60,000 tons of polluted sludge tackled by the project in Muthia village.

In an unpublished draft of an article to be published by Blacksmith in its *Journal of Health and Pollution*, supplied for this article, chromium levels fell drastically after worm treatment from 196 mg per kilogram to as little as 4.5 mg/kg. Levels of cadmium and lead also fell.

The Gujarat Pollution Control Board (GPCB) planned to use the worms to attack at least 10 other polluted sites in South Gujarat. Each of these sites is estimated to contain 25,000 or more metric tons of toxic sludge.

Gujrat officials, local NGOs and the U.S.-based NGO Blacksmith Institute are funding these projects.

Dr. Suneet Dabke, the industrial waste expert who discovered this technology, said his project was the first in the world to utilize living worms to defeat toxic pollution and it led to his getting a Fullbright Scholarship to further apply the worm technique. Dabke is working with Blacksmith to fund and carry out additional projects. In an e-mail from India, Dabke noted that studies of the area in 1995 by USAID had detected high levels of pollution as well as high levels of asthma and other respiratory illnesses.

The initial three-year clean up in Gujrat from 2006 to 2009 cost only $35,000, according to Dabke.

"This low-cost solution will go a long way in clearing toxic sludge," said Blacksmith's country coordinator Promila Sharma. "We are hopeful of using this technology in other countries too. Moreover, now that this technology has been successful, we will involve the polluters to take responsibility for the damage and help in cleaning it up."what-a-twist-earthworms-could-clean-up-toxic-waste/
Blacksmith was working with the Asian Development Bank to arrange funding for worm clean up projects lasting up to five years.

At first, clean-up teams excavated the soil and removed 3,000 tons of toxic wastes. They were forced to dig deeper and deeper as the extent of the problem grew before their eyes.

Then five tons of worms were added to the tilled soil. The worms were added every three months after tilling and mulching the soil.

Muthia is a small agricultural village on the edge of Ahmedabad, a major city of five million people. Textile and pharmaceutical companies dumped their toxic wastes in the village leaving the soil too contaminated to farm and the water undrinkable. The main pollutants were chromium, lead, iron and zinc.

Indian factories had long been accustomed to dump wastes without treatment or other controls. In 1996 anti-pollution laws were passed but the legacy pollution from decades of dumping was not addressed until the worm project began.

A 1995 study of the pollution in the areas was partly funded by USAID and it identified major problems. Ten years later, Blacksmith - a New York-based NGO which cleans up toxic waste sites in dozens of countries around the world since 1999 - helped study the problems and determined that a cleanup was necessary. Then came the idea of using earthworms.

"Sir Charles Darwin has referred Earthworms as unheralded soldiers of mankind which work day and night in soil and have over 600 million years of experience in land and soil management," said the draft paper Blacksmith will soon publish.

"Earthworms in general are tolerant to many chemical contaminants in soil including heavy metals and organic pollutants, and have been reported to bio-accumulate some of them in their tissue. Certain species of earthworms . . . have been found to remove heavy metals, pesticides and lipophilic organic micro-pollutants like poly aromatic hydrocarbons (PAH) from the soil."

In Muthia village, after removing three and a half feet of topsoil to a landfill, the team grew a cover crop and then spread 300,000 earthworms. The toxic substances were ingested and retained by the earthworms.

After the worm cycle ended, the team grew corn on the cleaned site and found only traces of the pollutants in the soil and the crop.

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